

United States
Department of
Agriculture

Forest
Service

Black Hills
National
Forest

June 2004

BLACKHILLS NATIONAL FOREST



Forest Thinning and Piling on Mystic District

FY2003 MONITORING AND EVALUATION REPORT

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Black Hills Forest Plan

Monitoring and Evaluation Report

Fiscal Year (FY) 2003

(October 2002 through September 2003)

What This Document Is

This is the annual monitoring and evaluation report for the Black Hills Land and Resource Management Plan (Forest Plan). A revision of the Forest Plan was completed in June 1997. The first amendment to this Forest Plan was completed in May 2001.

The basis for the annual monitoring report is in Chapter Four of the Forest Plan. This report does not discuss the entire inventory and monitoring that occurs in the Black Hills but only monitoring information related to the Forest Plan. More detailed studies may occur in association with individual projects that implement the Forest Plan. When relevant to Forestwide trends, information from these site-specific projects is incorporated into Forestwide monitoring.

The Black Hills Monitoring and Evaluation Report focuses on effectiveness monitoring, which focuses on whether or not the Forest is meeting or moving toward established objectives set forth in the 1997 Land and Resource Management Plan. Implementation monitoring or monitoring to insure standards and guidelines are implemented as directed in the Plan is a minor part of this monitoring report. The Washington Office (WO) appeal decision on the 1997 Land and Resource Management Plan directed the Forest to conduct more intensive monitoring than was originally in the 1997 plan.

The Forest has developed a "Monitoring Implementation Guide" to describe methods on how to implement the monitoring and evaluation requirements of the Revised Plan; see <http://www.fs.fed.us/r2/blackhills/projects/planning/2001Monitor/MonGuide.pdf>

Several environmental factors are monitored each year; however, not every item is scheduled for evaluation and reporting on an annual basis. Chapter Four of the Forest Plan indicates how often each item is reported.

Supporting documentation for this report is located in the Supervisor's Office, Black Hills National Forest.

Forest Plan Amendments

The Black Hills National Forest has undertaken changes to the 1997 Revised Land and Resource Management Plan (Forest Plan). These changes, or amendments, are in response to direction from the Chief of the Forest Service in his October 1999 decision on various appeals of the Revised Plan and to the settlement agreement stemming from the Veteran Salvage Timber Sale lawsuit. These changes are being accomplished in two phases.

In late August 2000, the Forest Service signed an agreement with several groups settling a lawsuit filed in November 1999. The lawsuit challenged implementation of certain projects on the Forest. Because of the settlement agreement, changes must be made to certain timber sales under contract and certain sales not yet sold, which are covered in the scope of the agreement. The Forest is continuing to make these changes as required.

The Phase I Amendment was completed, and the Regional Forester issued the decision in May 2001. This amendment contains interim protections for a variety of wildlife and plant species and allows the Forest to proceed with some limited project decisions for the next two to five years. The Phase I Amendment decision was appealed but was upheld on review.

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The Phase II Amendment process was officially initiated on November 28, 2001. Scoping comments were requested by January 28, 2002. The focus of this amendment is broader than Phase I and includes investigating strategies to address risks from fire and insects; reviewing protections for a variety of plant and animal species; and evaluating and designating research natural areas as appropriate. This significant amendment is targeted for completion in 2004.

Visit the Black Hills National Forest website at www.fs.fed.us/r2/blackhills for ongoing Phase II Amendment information.

William A.R. Ott
(for) BRAD EXTON
Acting Forest Supervisor

June 7, 2004
Date

Monitoring Item 1: Air Quality

Objective 101: Maintain air quality standards in accordance with state implementation plans.

Monitoring:

The Black Hills National Forest continued to provide representation at the quarterly Pennington County Air Quality Board meetings during the year 2003.

The Forest experienced no violations of the Clean Air Act on the Black Hills National Forest for the period year 2003 nor was there any air-quality complaints from individuals or other entities attributed to National Forest project activities (South Dakota - Administrative Rules - Article 34:10; Wyoming - Environmental Quality - Chapter 9.1).

Prescribed burning on the Black Hills National Forest including forest-residue-pile burns remains the single greatest potential air degradation activity. The Forest saw a significant increase in its prescribed burning activities in FY2003 from 1,433 to 3,481 acres. The increase in acres from 2002 was due to increased funding and favorable burning opportunities in the fall of 2002 and spring of 2003. The revised Forest Plan establishes an annual objective of 8,000 acres of this type of activity. The Forest is making every effort to increase the amount of fire restoration treatments. Increased emphasis will likely result in reduction in the amount of other types of burning that occur, including wildfire and pile burning to dispose of forest residues.

The following mitigation actions are implemented on the Black Hills National Forest during prescribed burning activities to minimize air-quality degradation:

- Receptors such as subdivisions, roads, towns, and other air-quality sensitive areas are identified during the prescribed burning planning process.
- Burning prescriptions are identified in the "prescribed burn plan" to ensure the air-quality standards are maintained in receptor areas.
- Prior to implementation of an approved prescribed burn project, weather conditions (predicted and current), including smoke dispersal predictions, are assessed to insure smoke management criteria can be met.
- Air quality is monitored on site and at receptor areas during burn implementation to insure air quality remains within identified parameters.

The Black Hills region has no non-attainment areas identified at this time (EPA. 2003. Criteria Pollutant Area Summary Report. Green Book. URL: <http://www.epa.gov/air/oaqps/greenbk/anc12.html>. February 6). Rapid City, South Dakota remains the key area of concern because it is close to being designated as a non-attainment area for PM-10, which is a pollutant often produced by smoke and dust. The concern for air quality in the Rapid City area has resulted in the Forest working jointly with the Rapid City Air Quality Office on guidelines for all National Forest burning activities. This 1995 guideline places restrictive measures for all forms of open burning planned on National Forest land in the Rapid City air shed. The Forest continues to work with the Pennington County Air Quality Office in mitigating all potential air-quality-impacting activities.

The State of South Dakota continues to develop its long range Air Quality Monitoring Database that will assimilate air-monitoring data, air-quality-influencing events, and weather data from 1990 to the present. The Forest assists the State by providing information on the occurrence of wildfires and prescribed fire activities on the Forest to keep the database current. In addition to activities on the National Forest, information from other area land management agencies including the Bureau of Land Management, Fish and Wildlife Service, Bureau of Indian Affairs, and State of South Dakota is entered in the database. Air monitoring data will come

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from the three area monitoring sites currently established at Rapid City, the Badlands, and Pine Ridge. Once established this database will represent a comprehensive resource available to land management agencies in monitoring air-quality trends and in determining air-quality links with various resource management activities and/or weather phenomena.

The State of South Dakota remains the key sounding board when it comes to air-quality issues related to management activities conducted by the Forest. Every effort is made to address air-quality concerns prior to project implementation and so that adjustments can be made as needed to mitigate air-quality issues.

Evaluation:

The Black Hills National Forest management activities, primarily prescribed burning, have met state clean air standards over the last six years. The Forest has accomplished approximately 25 percent of the prescribed burning objective in the Forest Plan over the last six years, but has exceeded the historic annual level of wildfire acreage.

Monitoring Item 9: Vegetative Diversity and Snag Retention

Objective: 211. In Ponderosa pine forested portions of a watershed, maintain an average of 2 hard snags per acre on south facing slopes and 4 hard snags per acre on north facing slopes, well dispersed across the watershed through the rotation. Calculate as a per acre average for the watershed; some acres may have no snags while others may exceed the average. In other forest types maintain an average of 6 hard snags per acre, well dispersed across the watershed. (Revised Amendment 1.)

Monitoring:

Snag transects were not monitored in 2003. Snag densities have not changed substantially from what was reported in 2002. There would be some additional tree mortality caused by insect infestation (see Monitoring Item 20b) and the 18,000-acre Red Point Fire incident. See the 2002 Monitoring and Five-Year Evaluation Report for more information. It is available on our website:

<http://www.fs.fed.us/r2/blackhills/projects/planning/2002Monitor/index.shtml>



Wildlife Tree (Snag)

Monitoring Item 13: Regeneration

36 CFR 219.27(c)(3) When trees are cut to achieve timber production objectives, the cuttings shall be made in such a way as to assure that the technology and knowledge exists to adequately restock the lands within 5 years after final harvest. Research and experience shall be the basis for determining whether the harvest and regeneration practices planned can be expected to result in adequate restocking. Adequate restocking means that the cut area will contain the minimum number, size, distribution, and species composition of regeneration as specified in regional silvicultural guides for each forest type. Five years after final harvest means 5 years after clearcut, 5 years after final overstory removal in shelterwood cutting, 5 years after the seed tree removal cut in seed tree cutting, or 5 years after selection cutting.

Monitoring:

Surveys for natural regeneration were done on 10,243 acres in FY2003. Out of the total acres surveyed, 6,848 acres were certified for regeneration. The remaining 3,395 acres will be surveyed in FY2005 to determine certification.

Surveys (third-year and fifth-year) are conducted before certification is established; certification may be established at any point in the three surveys that regeneration is verified. Over time, the acres certified will equal the acres surveyed.

The source of this data is the FY2003 SILVA99 Report for the Black Hills National Forest.



Regeneration

Ponderosa-pine seed is produced almost every year, with abundant crops every two to five years (Boldt and Van Deusen 1974), although seed production on the Limestone Plateau and some portions of the Bearlodge Mountains has been sporadic in recent years. In areas with prolific seed production and favorable climate, natural regeneration of ponderosa pine can be quite successful. Frequent rain showers throughout the growing season, which lasts from early March to August, is the major climatic factor contributing to the prolific growth and establishment of ponderosa pine. (Reference: Ecology, Silviculture, & Management of Black Hills Ponderosa Pine by Shepperd & Battaglia RMRS-GTR-97, September 2002)

Silvicultural treatments use the recommended systems found in Black Hills silvicultural documents (Boldt 1974 and Shepperd 2002). The Forest does not remove the overstory in shelterwood silvicultural systems until the understory is established as result of seed cut.

Monitoring Item 14: Timber Production

Objectives:

303. Offer the following allowable sale quantity (ASQ) of timber on suitable and available timberlands in the next decade:

Allowable Sale Quantity From Suitable Lands: (Decade Total)	
Sawtimber	
Million Cubic Feet	181
(Million) Board Feet	838
Roundwood	
Million Cubic Feet	21
(Million) Board Feet	N/A
Total	
Million Cubic Feet	202
(Million) Board Feet	838

304. On lands not identified as suitable and available for timber harvest, timber volume may be offered as a by-product of other vegetation management objectives. This volume would be offered in addition to the ASQ.

305. The ASQ in Objective 303 includes the following non-interchangeable component in the Norbeck Wildlife Preserve. This portion of the ASQ is not interchangeable with the volume outside the Preserve.

Allowable Sale Quantity From Suitable Lands In Norbeck Wildlife Preserve: (Decade Total)	
Sawtimber	
Million Cubic Feet	5.4
(Million) Board Feet	27.0
Roundwood	
Million Cubic Feet	1.0
(Million) Board Feet	N/A
Total	
Million Cubic Feet	6.4
(Million) Board Feet	27.0

The 10-year allowable sale quantity expressed on an average annual basis:

Forest Plan	Million Cubic Feet (MMCF)	Hundred Cubic Feet (ccf)
Sawtimber	18.1	181,000
POL	2.1	21,000
Total ASQ	20.2	202,000

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Monitoring:

The allowable sale quantity (ASQ) in the Forest Plan is based on the total during the decade from FY1997 through FY2006. (Record of Decision, p. ROD-35).

The ASQ is a maximum level of timber that may be sold during the first decade after plan approval. A ceiling on the level of timber that can be sold, the ASQ takes into account available funding, other multiple-use values, and compliance with standards and guidelines that provide environmental protection. ASQ is not an absolute yield that must be achieved (1997 Forest Plan FEIS, p. II-36).

Harvest acreage over the decade is an estimated 255,000 acres or an average of 25,500 acres per year at the full funding level. The Forest is producing approximately 55 percent of the planned average at the full funding level.

Year 2003 Summary as follows:

Harvest acres from signed decisions are 14,567 acres.

Funded target	45 mmbf
Offer volume	65.2 mmbf
Harvested volume	67.7 mmbf

(Source: PTSAR: Periodic Timber Sale Accomplishment Report: green volume)

All volume above is from suitable lands except the following:

Needles 2 Timber Sale – 0.3 mmbf harvested, non-interchangeable component.

Beaver Park - 3.9 mmbf



First load of timber from the Needles 2 Timber Sale

Monitoring Item 17: Forage Utilization

Objective 301.

Produce on a sustained basis and make available up to 233 million pounds of forage for livestock and wildlife use each year (weather permitting). The location and amount of forage produced under the forest canopy will vary with the density of the overstory. This may necessitate changes in where and how both livestock and wildlife grazing takes place on a local basis over the rotation of a stand of timber.

a. Livestock use will be up to 127 million pounds of forage per year or approximately 128,000 AUMs.

b. Wildlife use will be up to 106 million pounds of forage per year or approximate population levels of 70,000 deer and 4,500 elk or other combinations that use the same amount of forage.

Monitoring:

The objective listed above relates to annual projected livestock forage use. The Phase I Amendment to the 1997 Land and Resource Management Plan changed Guidelines 2505 and 2506 to standards. These two standards relate to proper use or residual levels in riparian and upland forest rangeland settings.

Following direction in Standard 2506, districts continue to develop new Allotment Management Plans (AMPs) for allotments recently approved environmental assessments. The districts issue Annual Operating Instructions (AOIs) for each allotment on the Forest. Utilization or residual guidelines are included in the AMPs and/or AOIs.

In FY2003, actual grazing use on the Forest was 122,971 AUMs. This is approximately 96 percent of the annual projected Forest grazing capacity of 128,000 AUMs available for livestock utilization identified in the 1997 Forest Plan. Loss of forage in allotments because of wildland fires that occurred in 2001 through 2003 and dry conditions are reasons the Forest Plan AUMs were not met. Phase I Amendment did not reduce the grazing capacity for livestock use.

Items Monitored	2002	2003
Livestock AUMs Grazed	114,749	122,971
Livestock AUMs Permitted	125,073	124,993

Districts monitored and evaluated approximately 865,073 acres of range allotments to determine forage utilization. Following is a breakdown of acres and grazing allotments monitored by ranger district:

Items Monitored	Hell Canyon	Mystic	Northern Hills	Bearlodge
Acres Monitored and Evaluated for Livestock Forage Utilization	313,013	157,771	257,654	136,635
Grazing Allotments Evaluated	24	25	28	15

The monitoring is completed by both Forest Service range staffs and livestock permittees. The districts collected forage utilization data by ocular estimate, photos, and stubble height measurements on key areas throughout the allotments. Forage utilization on the allotments surveyed was within Forest Plan standards. The use on a few areas in some allotments did exceed proper allowable use guidelines; however, these areas

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represent a small percentage of the overall utilization on the Forest. A monitoring training session was held in 2003 with approximately 50 participants. The Districts are planning to do more and smaller secessions during the summer of 2004. The “Wyoming Range Guide” will be used in permittee training sessions.

Findings and conclusions relevant to the evaluation follow:

1. Measured forage utilization exceeded proper allowable use guidelines on a small amount of areas within allotments surveyed (less than 5 percent). These areas will continue to be monitored to see if management changes are needed. Forage utilization throughout all the allotments surveyed were within Forest Plan standards (2505 – Proper Allowable use Guidelines) and allotment management objectives. Drought conditions reduced use on some allotments.
2. The Forest continues to promote more permittee assistance in monitoring grazing allotments with training sessions and using the “Wyoming Range Guide” and “Black Hills Range Guide.”

Monitoring Item 18a: Plant Sensitive Species

Viola selkirkii (Great-Spurred Violet)



Photo by Forest Staff at *Viola selkirkii* site VISE2-7, May 28, 2003.

A total of 17 occurrences of *Viola selkirkii* are currently known within the Black Elk Wilderness, Norbeck Wildlife Preserve and Custer State Park in the Black Hills. Ten of the occurrences are located within four distinct watersheds on lands administered by the Black Hills National Forest. Because potential habitats are believed to occur and are relatively remote, there may be additional occurrences not yet been documented.

On the Forest, *Viola selkirkii* is relatively secure from most potential risks, with the exception of an extreme climatic change. The 10 known occurrences on Black Hills National Forest lands are not currently affected from management activities (i.e. timber management and grazing is not currently occurring at known occurrences) but may be vulnerable to impacts from hikers and rock climbers in the future. In addition, noxious weed or other exotic plant species invasion control efforts, and elk or mountain goat trampling or browsing are potential risks at some sites. Naturally occurring periodic flooding may reduce the size and extent of some patches but may create habitat for others.

The monitoring strategy for this species on Forest Service-administered land currently includes the following: (1) surveys for additional occurrences, (2) inventory of new and currently known occurrences on a periodic basis, and (3) annual monitoring of one of the three largest occurrences. Potential survey sites include watersheds where the species is known to occur as well as other high elevation watersheds with deep canyons and boreal vegetation. Surveys or monitoring needs are to be conducted during the violet's flowering period, which generally occurs from May 10 to May 30, when the species can be identified.

The monitoring design includes re-inventory of known Forest occurrences at least every five years and to sample all known sites in the same year. In addition to periodic inventories, monitoring includes obtaining baseline data on known Black Hills National Forest occurrences during and following a drought cycle (or at least two consecutive years of below-average precipitation). Occurrence numbers collected in 2000 and 2001 may be a reflection of a series of relatively wet years since 1996 (NOAA 1996-2001). Documenting relative occurrence levels and extent of great-spurred violet during dry years should provide insight into the role precipitation plays in the distribution and abundance of this species. Finally, the monitoring design includes monitoring great-spurred violet sites affected by a fire or a significant flood event.

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The current protocol design includes annual monitoring of “Violet Valley” in Norbeck Wildlife Preserve. The “Violet Valley” site was selected because it is one of the three largest occurrences of the great-spurred violet on Black Hills National Forest lands, it is relatively accessible, and it has the largest combination of potential risks from hikers, elk, random stochastic events (i.e. wildfire, flooding), and exotic plant (includes noxious weeds) invasion. Further, because it is one of the lower elevation sites, it is likely that declines associated with drought conditions would occur here before they occur at higher elevations. The “Violet Valley” location will be used as an indicator of whether other sites need to be monitored. The current trigger for additional monitoring would be the absence of one or more of the four largest patches (there are eight distinct patches at the “Violet Valley” site). If this occurs, an effort will be made to document the reason (that is, drought, elk, weeds) and select two additional *Viola selkirkii* occurrences to monitor based on the cause of the disruption and current information on known risks to other sites.

Monitoring Design:

1. On an annual basis, monitor presence/absence of the four largest sub-populations at site number VISE2-2, “Violet Valley.” If one or more of the four largest sub-populations at “Violet Valley” are not present, document the reason (i.e. drought, elk, noxious weeds) if it can be determined. Select two other sites in other drainages to monitor presence/absence to determine if other populations are being affected in the same way.

***Viola selkirkii* site VISE2-2, was monitored on May 20, 2003. The four largest sub-populations were present.**

2. Document any weeds designated as noxious by South Dakota and Wyoming. Document if the weeds are co-located with *Viola selkirkii* or at what distance the weed species is located away from the occurrence site.

No weeds designated as noxious by South Dakota or Wyoming were present at VISE2-2 on May 20, 2003.

3. On any currently known violet site that is affected by a flood or fire event, monitor for presence/absence.

No occurrences were known to be affected by a flood or fire event prior to the monitoring period. No flood or fire disturbances were observed at the known sites monitored in 2003.

The monitoring design also includes re-inventory of known Forest occurrences at least every five years and to sample all known sites in the same year. In addition to periodic inventories, monitoring includes obtaining baseline data on known Black Hills National Forest occurrences during a drought cycle. Re-inventory occurred in 2003 on all 10 sites known to occur on Forest Service-administered land. Because 2003 was classified as a drought year, baseline data were documented at all 10 sites.

***Adiantum capillus-veneris* (Southern Maidenhair Fern)**

The Forest Service administers developed picnic grounds at two ends of the only known *Adiantum capillus-veneris* population located within the Black Hills. The majority of the central portion of the population is located along Cascade Creek on the Whitney Preserve managed by The Nature Conservancy. Recent data (2000-2002) document increased extent of the fern in comparison to earlier reports. However, the current size of the fern population could be in response to several recent years of higher-than-average moisture in the Black Hills (NOAA 1996-2001) as well as recent conservation activities taking place in the Cascade Creek valley. The population appears to be stable or increasing, but there is insufficient data to demonstrate a trend at the present time.

The confinement of this species to a single watershed in the Black Hills makes it vulnerable to random events such as extreme drought or a disease outbreak. However, the relatively constant water from springs with origins from a deep underground source increases the likelihood of the species' persistence. In addition, the

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existence of multiple subpopulations of the species in the watershed will potentially help buffer against any catastrophic disturbances in the area.

Effects associated with ongoing recreational use and invasion by or treatment of exotic plant species (including noxious weeds) are currently considered to be the most significant risks to the fern and its habitat on Black Hills National Forest-administered lands. Footpaths and visitor created “nick points or trails” (paths that have been or can be created simply by recreationists leaving the developed established trail system to access sections of Cascade Creek), trampling of vegetation, or mowing near *Adiantum capillus-veneris* patches have been identified as past or current impacts to the species and its habitat. Portions of the population occur in areas naturally restrictive to recreational access by dense vegetation or inaccessible slopes and therefore unlikely to be impacted by recreational use. *Cirsium arvense* (Canada thistle) is a state-listed noxious weed, and *Elaeagnus angustifolia* (Russian olive) and *Tamarix* sp. (salt cedar) are non-native invasive species of concern, which currently invade the Cascade Creek Valley. *Lythrum salicaria* (purple loosestrife) is not known to occur within the Cascade Creek Valley or anywhere close by, but its aggressive nature if it were to invade would give it the potential to impact riparian natives such as *Adiantum capillus-veneris*.

Additional potential risks to the species could include hydrologic or geologic modifications or erosion. Although no evidence of plant collection has been documented to date, it could also be a potential future risk to *Adiantum capillus-veneris* along Cascade Creek since the area has been identified as a botanical attraction in local tourist information and other publications.

Quantitative monitoring is problematic as some areas at Cascade Springs and Cascade Falls are inaccessible or involve high risk of damage to the plants from trampling or dislodging them on steep slopes. Also, because the species expands clonally, it is not possible to determine the number of individual plants. Baseline monitoring began in June 2000, and ongoing annual monitoring is occurring. Monitoring of southern maidenhair fern can occur any time during the growing season. Monitoring includes verification of presence/absence of mapped patches along stream transects and recording any new occurrences. The current design includes documenting any changes to the population to be indicated on baseline map diagrams for both sites. Monitoring is to document “nick points or trails” that actually extend into *Adiantum capillus-veneris* patches, trails, stream bank erosion, weeds, or other disturbances in or near the populations. If the extent of the mapped patches declines by 10 percent or more, the monitoring design includes consultation with ecologists, botanists, and biometricians knowledgeable about the species to develop a more rigorous monitoring strategy.

As of 2001, the United States Geological Survey (USGS) is no longer monitoring the gauging station at the southern end of J. H. Keith Cascade Springs Picnic Ground. A water level monitor (piezometer) had been considered for installation for 2002, but it was then determined the site does not lend itself to using this monitoring method. In consultation with the Rocky Mountain Research Station on February 6, 2003, the monitoring design to measure water levels was revised and currently includes permanently placing one water level measuring device at each of the springs.

Monitoring Design:

1. Monitor presence/absence of patches along stream transects on an annual basis. If the number of patches decline by 10 percent or more, consult on a more rigorous design with the Rocky Mountain Research Station.

A total of 55 patches of *Adiantum capillus-veneris* were counted on July 7, 2003 at Cascade Springs. There were 52 patches counted in 2002 and 49 patches counted in 2001. One very small patch (< ½ square meter) documented in 2002 was not present on the monitoring date in 2003.

A total of 22 patches of *Adiantum capillus-veneris* were counted on July 7, 2003 at Cascade Falls. In 2002 a total of 17 patches were counted, and 18 patches were counted in 2001. Some previously separate patches have merged and become single, larger patches at Cascade Falls.

There was no decline in the number of patches at either location.

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2. Recreation “nick points or trails” -- Document number of nick points that actually extend into populations.

No trails extend into any patches of *Adiantum capillus-veneris* at either Cascade Springs or at Cascade Falls. The end of one nick-point trail that lies north and west of the gazebo at Cascade Springs has been extended to the west through recreational use and immediately adjoins a patch of *Adiantum capillus-veneris*.

3. Monitor water levels at the site by installing one permanent measuring device at each of the springs. Monitor water levels on the same calendar date from year to year.

Permanent water measuring devices were not installed at Cascade Springs due to heritage resource significance at the springs.

4. Document any weeds designated as noxious by South Dakota and Wyoming, and the following non-native invasive species of concern: *Elaeagnus angustifolia* (Russian olive) and *Tamarix* sp. (salt cedar). Document if the weeds are co-located with southern maidenhair fern or at what distance the weed species is located away from the occurrence site if occupying the same ecological type.

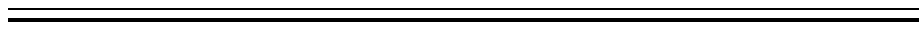
***Cirsium arvense* (Canada thistle) continues to be present at Cascade Springs and Cascade Falls. It is only rarely found in the direct vicinity of *Adiantum capillus veneris* and is not located in the same ecological type (not in the saturated areas).**

5. Document erosion patches occurring at any southern maidenhair patch.

The only erosion patch associated with any *Adiantum capillus-veneris* patch is the same one documented in 2001 at Cascade Falls. The continued migration of the stream across the riparian floodplain results in expansion of this erosion patch.

6. Document any verifiable unauthorized collections of *Adiantum capillus-veneris*.

There was no evidence of unauthorized collections of *Adiantum capillus-veneris* at either Cascade Springs or Cascade Falls at the time monitoring was completed in 2003.



***Epipactis gigantea* (Giant Helleborine)**

The only known occurrence of *Epipactis gigantea* is located along Cascade Creek in the southern Black Hills. The species is located on land administered by the Black Hills National Forest at Cascade Springs. This occurrence is a small portion of a much larger population of which the majority occurs downstream on The Nature Conservancy's Whitney Preserve. Recent data (2000-2002) document increased extent of the orchid in comparison to earlier reports. However, the current size of the orchid population could be in response to several recent years of higher than average moisture in the Black Hills (NOAA 1996-2001), as well as recent conservation activities taking place in the Cascade Creek valley. The population appears to be stable or increasing, but there is insufficient data to demonstrate a trend at the present time.

The confinement of this species to a single watershed in the Black Hills makes it vulnerable to random events such as extreme drought or a disease outbreak. However, the relatively constant water from springs with origins from a deep underground source increases the likelihood of the species' persistence. In addition, the existence of multiple subpopulations of the species in the watershed will potentially help buffer against any potential catastrophic disturbances in the area.

Effects associated with ongoing recreational use and invasion by or treatment of exotic plant species (including noxious weeds) are currently considered to be the most significant risks to the fern and its habitat on the Black Hills National Forest-administered lands. Footpaths and visitor created “nick points or trails,” trampling of vegetation, or mowing near *Epipactis gigantea* patches have been identified as past or current impacts to the species and its habitat. Portions of the population occur in areas naturally restrictive to

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recreational access by dense vegetation or inaccessible slopes and therefore unlikely to be impacted by recreationists. *Cirsium arvense* (Canada thistle) is a state-listed noxious weed, and *Elaeagnus angustifolia* (Russian olive) and *Tamarix* sp. (salt cedar) are non-native invasive species of concern, which currently invade the Cascade Creek valley. *Lythrum salicaria* (purple loosestrife) is not known to occur within the Cascade Creek valley or anywhere close by, but if it were to invade, its aggressive nature would allow the potential to impact riparian natives such as *Epipactis gigantea*.

Additional potential risks to the species could include hydrologic or geologic erosion. Although no evidence of plant collection has been documented to date, it could also be a potential future risk to *Epipactis gigantea* along Cascade Creek since the area has been identified as a botanical attraction in local tourist information and other publications.

Quantitative monitoring is problematic as some areas at Cascade Springs and Cascade Falls are inaccessible or involve high risk of damage to the plants from trampling or dislodging them on steep slopes. Also, because the species expands clonally, it is not possible to determine the number of individual plants. Baseline monitoring began in June 2000, and ongoing annual monitoring is occurring. Monitoring includes verification of presence/absence of mapped patches along stream transects and recording any new occurrences. The current design includes documenting any changes to the population to be indicated on baseline map diagrams for both sites. Monitoring is to document “nick points or trails” that actually extend into *Epipactis gigantea* patches. Monitoring also includes documenting stream bank erosion, weeds, or other disturbances in or near the populations. If the extent of the mapped patches declines by 10 percent or more, the monitoring design includes consultation with ecologists, botanists, and biometricians knowledgeable about the species to develop a more rigorous monitoring strategy. Monitoring is most efficiently conducted during the orchid’s flowering period in June.

As of 2001, the USGS no longer monitors the gauging station at the southern end of J. H. Keith Cascade Springs Picnic Ground. A water level monitor (piezometer) had been considered for installation for 2002, but it was then determined the site does not lend itself to using this monitoring method. In consultation with the Rocky Mountain Research Station on February 6, 2003, the monitoring design to measure water levels was revised and currently includes permanently placing one water level measuring device at each of the two springs in 2003.

Monitoring Design:

1. Monitor presence/absence of patches along stream transects on an annual basis. If the number of patches decline by 10 percent or more, consult on a more rigorous design with the Rocky Mountain Research Station.

A total of 46 patches of *Epipactis gigantea* were located in 2003 at Cascade Springs. Forty patches were counted in 2002 and 2001. There was no decline in the number of patches from those documented in 2002.

2. Recreation nick points -- Document number of nick points that actually extend into populations.

There are four nick points at Cascade Springs that adjoin *Epipactis gigantea* patches, but only one of the trails actually extend into an orchid patch.

There is an occasionally used trail that actually extends into the orchid patch at the first springs (site identifier RP1), but the trail is not as well used as others at Cascade Springs.

Recreation access through a second nick point documented in previous year’s monitoring has been limited by a fence constructed a couple of years ago. In 2003, there was no evidence the recreational use on this nick point was extending into the orchid patch.

A third nick-point trail, previously identified in earlier monitoring seasons, continues to overgrow with shrubs; however, a trail paralleling a fence leads to a cement platform below the nick point. The nick point itself does not extend into patches of orchids, but patches can be accessed because they are adjacent to the nick-point trail.

Recreationists continue to use the fourth nick-point trail, leading from the gazebo north to Cascade Creek. Two smaller nick-point trails have become visible off this main trail leading to the creek. The end of the main nick

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point is adjacent to several small clumps of *Epipactis gigantea* but does not extend into orchid patches.

3. Monitor water levels at the site by installing one permanent measuring device at each of the springs.
Monitor water levels on the same calendar date from year to year.

Permanent water measuring devices were not installed due to heritage resource significance at the springs.

4. Document any weeds designated as noxious by South Dakota and Wyoming and the following non-native invasive species of concern: *Elaeagnus angustifolia* (Russian olive) and *Tamarix* sp. (salt cedar).
Document if the weeds are co-located with *Epipactis gigantea* or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type.

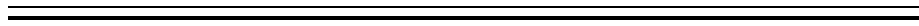
***Cirsium arvense* (Canada thistle) continues to be present and no change has been noted since 2002. In a limited number of areas, individuals of Canada thistle co-occur with *Epipactis gigantea*; however, Canada thistle does not form the dense patches in this ecological type at Cascade Springs. The larger dense patches of Canada thistle are in a different ecological type and are at some distance from the orchid.**

5. Document erosion patches occurring at any *Epipactis gigantea* suboccurrence.

No erosion patches were observed at any *Epipactis gigantea* suboccurrence.

6. Document any verifiable unauthorized collections of *Epipactis gigantea*.

There was no evidence of unauthorized collections of *Epipactis gigantea* at the time monitoring was completed in 2003.



***Salix serissima* (Autumn Willow)**



Photo by Forest Staff at *Salix serissima* site SASE2 (McIntosh Fen) June 25, 2003.

Two occurrences of *Salix serissima* are currently known to occur on land administered by the Black Hills National Forest. Until 2002, a single occurrence of *Salix serissima* was known to occur at McIntosh Fen Botanical Area. A second occurrence was located within a fenced enclosure along Middle Boxelder Creek in 2002. The persistence of this species in the Black Hills is dependent on conserving these two known populations.

Because this is an obligate wetland species, the primary risk to its persistence and reproductive success is any lowering of the water table where it occurs, whether it is natural or human-induced. Noxious weeds, invading woody species (conifer encroachment), fungal infections, or insect infestations have been identified as posing

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concern for this species. *Cirsium arvense* (Canada thistle) currently occurs within the McIntosh Fen Botanical Area, although high soil-moisture levels in the fen itself appear to exclude Canada thistle from the *Salix serissima* habitat. *Lythrum salicaria* (purple loosestrife) is not known to occur at either of the sites or anywhere close by but is very aggressive and has the potential to out compete riparian natives, including *Salix serissima*. A fungal infection was noted on the leaves of autumn willow at McIntosh Fen in 2001 and willow borer has been documented at the Middle Boxelder Creek occurrence. Fishing occurs along Castle Creek (near the fen) in the McIntosh Fen Botanical Area, and a designated snowmobile trail crosses the Botanical Area but does not extend into the autumn willow occurrence. At this time, no impacts have been documented to occur to the willow from either activity. No effects have been documented from wildlife use or trespass cattle at these sites.

A rigorous monitoring strategy was designed and implemented in 2000 for its occurrence at McIntosh Fen and has been revised to add the second autumn willow occurrence and to continue to attempt to detect and respond in a timely manner to changes in extent and condition of autumn willow and its habitat. The protocol focuses on annually monitoring of the following: (1) the extent of the population, (2) total number of individuals and number of reproductive plants, (3) number of plants infected with rust fungus or other damaging agents, (4) water table level, and (5) presence of exotic invasive species.

Two piezometers were installed at McIntosh Fen in 2001 to annually monitor water levels. However, the piezometers destabilized. This may have been caused by freezing/thawing conditions or because the fen is a floating mat of organic material. Since the water level has been observed above-ground during higher precipitation years, an above ground water level sampling method may be used. This method is included for the protocol for 2003.

Monitoring of *Salix serissima* needs to occur in June during the blooming period so the total number of reproductive individuals can be determined.

Monitoring Design:

On an annual basis at both *Salix serissima* sites:

1. Global Positioning System (GPS) new endpoints if site boundaries are expanded.

A GPS point was recorded at the northern end where the distribution of *Salix serissima* individuals at McIntosh Fen had expanded.

No expansion of the *Salix serissima* occurrence was observed at the Middle Boxelder Creek location.

2. Count individuals during the blooming period (documenting total number of individuals and total reproductive individuals). If the number of individuals declines by more than 10 percent, consult on a more rigorous design with the Rocky Mountain Research Station.

A total of 764 individual clumps of *Salix serissima* were counted in 2003 at McIntosh Fen. *Salix serissima* counts from previous years were as follows:

2002	560 individuals
2001	453 individuals

There was no decline in total number of individuals from the previous year.

A total of 16 individual clumps of *Salix serissima* were counted in 2003 at the Middle Boxelder Creek occurrence. In 2002, 13 individual clumps of *Salix serissima* were counted. There was no decline in total number of individuals from the previous year.

3. Document the number of plants infected with rust fungus or other damaging agents (i.e. willow borer).

No rust or other damaging agent was evident at the time monitoring occurred at McIntosh Fen on June 25, 2003. Monitoring occurred on July 16, 2003 at the Middle Boxelder Creek occurrence, and no rust or other damaging agent was evident on *Salix serissima* individuals.

4. Measure aboveground water levels by bisecting the sub-populations (one permanent transect at each sub-

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population) at McIntosh Fen, and bisecting the Middle Fork Boxelder occurrence (one permanent transect). The transects need to extend into dry area above where any surface water could be expected to expand. This monitoring needs to occur on the same calendar date from year to year.

No permanent transects were installed in 2003 at either *Salix serissima* occurrence.

5. Document any weeds designated as noxious by South Dakota or Wyoming. Document if the weeds are co-located with *Salix serissima*, or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type.

Cirsium arvense (Canada thistle) was the only noxious weed species occurring at McIntosh Fen in 2003. Canada thistle does not occur with the saturated conditions where *Salix serissima* occurs but is located nearby where the soil is not saturated.

No weeds were observed within the enclosure at the Middle Boxelder Creek occurrence.



Lycopodium complanatum (Trailing Clubmoss)



Photo by Andrew King at *Lycopodium complanatum* site LYCO3-4 August 28, 2003.

There are currently four known occurrences of *Lycopodium complanatum* located on Forest Service-administered lands in the Black Hills identified with the following site numbers: (LYCO3-1, LYCO3-2, LYCO3-3, and LYCO3-4). Sites LYCO3-3 and LYCO3-4 were located late (September and October) in 2002. Site number LYCO3-4 was a new occurrence located in an area burned by the Grizzly Gulch wildfire, and it is unknown what long-term effects the fire will have on the persistence of the species at this site.

The greatest risk identified to *Lycopodium complanatum* based on baseline data gathered from sites of LYCO3-1, LYCO3-2, and LYCO3-3, is the small number and limited size of occurrences on Forest Service-administered lands. There are currently no apparent or ongoing risks to the species, but the known locations of this boreal remnant species are small enough that random events, such as drought or fire, could eradicate an occurrence. Although exotic, invasive plants are not currently an immediate risk to the species, there is

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potential for invasion because of their proximity.

Because the persistence of this species is contingent on conserving occurrences on public land, the current monitoring protocol is designed to detect and respond in a timely manner to changes in the extent and condition of the species and its habitat. The species is an evergreen and can be monitored at any time during the growing season (May to September) but is best observed in the spring or fall when overstory or other understory vegetative cover is low. However, more complete weed documentation is likely to be obtained during the growing season. Monitoring (human impact) of these sites may be the greatest risk to the species. The monitoring design has been modified to keep site disturbance at a minimum.

Monitoring Design:

1. Monitor the following *Lycopodium complanatum* sites for presence/absence on an annual basis:

- LYCO3-1 (Sand Creek site)
- LYCO3-2 (Custer Crossing site)
- LYCO3-3 (Grizzly Gulch wildfire site)

Lycopodium complanatum was present at LYCO3-1 and LYCO3-2 on August 26, 2003.

Lycopodium complanatum was present at LYCO3-3 on August 28, 2003.

2. Install permanently placed PVC pipe along the edge of LYCO3-1 at the easiest visual observation point. The PVC pipe will act as a visual linear transect dividing the site into segments. If 10 percent or greater canopy cover from any one of the segments is missing, then the rest of the site will be examined. This allows monitoring of the site with minimal human impact. If the extent declines by 10 percent or more, consult on a more rigorous design with the Rocky Mountain Research Station.

Visual estimated canopy cover range percentages of *Lycopodium complanatum* at LYCO3-1 in 2003 were as follows:

- Eastern most quadrant (Quadrant 1): 42 - 52%
- Second quadrant from the east (Quadrant 2): 65 - 72%
- Second quadrant from the west (Quadrant 3): 45 - 52%
- Western most quadrant (Quadrant 4): 15 - 20%

Monitoring by visual observations of canopy cover estimates for *Lycopodium complanatum* began in 2002. The canopy cover estimates at LYCO3-1 in 2002 were as follows:

- Eastern most quadrant (Quadrant 1): 50%
- Second quadrant from the east (Quadrant 2): 75%
- Second quadrant from the west (Quadrant 3): 75%
- Western most quadrant (Quadrant 4): 20%

3. Document any weeds designated as noxious by South Dakota or Wyoming. Document if the weeds are co-located with *Lycopodium complanatum* or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type.

No noxious weeds were observed at sites LYCO3-1 or LYCO3-2.

Cynoglossum officinale (Hound's tongue) was observed in very limited numbers at site LYCO3-3. This weed is more abundant down slope of the *Lycopodium complanatum* occurrence.

Platanthera orbiculata (Large Roundleaf Orchid)

Platanthera orbiculata is relatively secure in the Black Hills based on the large number of occurrences (31) distributed in three geographically separated regions on Black Hills National Forest administered land, each

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within a different geological type: (1) Bearlodge Mountains, (2) Northwestern Black Hills (contains the largest cluster of sites), and (3) Black Elk Wilderness. The species is present in patchy, scattered occurrences on shady, northwest to northeast facing slopes and draws in strong association with paper birch/hazelnut and white spruce forests. The species persistence in the Black Hills is primarily limited by the small extent of cool, moist boreal habitat, although it appears to be secure on the forest at this time. Long-term droughts or dramatic climate changes characterized by drier and warmer conditions may present the greatest risk to the orchid and its habitat. All currently known occurrences are within grazing allotments with the exception of locations in the Black Elk Wilderness. However, risks to most of the population from this use are low because many of the sites are on steep slopes with dense shrub vegetation. Risks from other management activities (i.e. timber management) are currently low. No ongoing recreational impacts are being noted at the Black Elk Wilderness occurrences; however, they are near an intensively used trail. Other potential future risk factors could include plant collection and noxious weed invasion.

The most recent data available were used in designing monitoring for this species. Designated “core” orchid occurrences were identified using two criteria: geographic distribution of the occurrence and size (estimated number of individuals). Three occurrences from each of the three primary geographic areas listed above were designated as core occurrences for monitoring.

The monitoring was designed to assess the status of the nine core occurrences on an annual basis. The monitoring addresses three questions: (1) is the species present; (2) is there evidence of plant collecting; and (3) have noxious weeds and other exotic invasive species become established at the site? Although the proposed monitoring focuses on the presence or absence of a given occurrence, a categorical estimate of the number of individuals is to be collected. If any of the core occurrences is not present, then the reason is to be documented if it can be determined and then randomly select additional sites to serve as core sites.

The second aspect of the monitoring as currently designed is to provide baseline data on the persistence of the orchid during dry conditions. During a drought, the design has been revised to monitor select sites for presence/absence and census the number of individuals during the first and second consecutive drought years. Our assumption is the high numbers of orchids observed in 2000 were partially reflective of several years of above-average precipitation. The nine core sites and three other sites are to be monitored for presence or absence with a census taken during the second non-drought year following the dry period. Data on orchid population persistence and numbers in both wet and dry years will provide valuable data for reassessing the species and for re-examining and potentially changing the monitoring design.

Monitoring of this plant is best conducted during the blooming period in late June to July. The plant is identifiable later in the season, and monitoring could take place in early August during a cool, moist year if the need arises. Plants with single leaves, two leaves, and plants with leaves and flowering stalks are counted as individual plants.

Monitoring Design:

1. Annually monitor presence/absence of known site locations in the Bearlodge Mountains: site PLOR4-1, site PLOR4-2, and site PLOR4-3. If any of the key monitoring population sites is not present (refer to discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds).

***Platanthera orbiculata* was present at all three sites in 2003.**

2. Annually monitor presence/absence of Black Elk Wilderness locations: site PLOR4-23, site PLOR4-24, and site PLOR4-25. If any of the key monitoring population sites is not present (refer to discussion above regarding climatic ties), document reason if it can be determined (i.e. drought, fire, noxious weeds).

***Platanthera orbiculata* was present at all three sites in 2003.**

3. Annually monitor presence/absence of three key monitoring population sites in the northwestern Black Hills: site PLOR4-6, site PLOR4-12, and site PLOR4-19. If any of the key monitoring population sites is not present (refer to discussion above regarding climatic ties), document reason if it can be determined

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(i.e., drought, fire, noxious weeds).

***Platanthera orbiculata* was present at all three sites in 2003.**

4. If drought occurs, monitor three additional sites: PLOR4-4, -21, and -22 (these sites were chosen for variation in geographic distribution). During the first drought year count individuals at all 12 sites. During the second drought year and beyond, monitor all 12 sites for presence/absence. During the second non-drought year, count individuals at all 12 sites. After the second non-drought year reassess the monitoring plan to determine future needs.

The year 2003 was documented as a drought year in western South Dakota and northeastern Wyoming.

***Platanthera orbiculata* was present at additional drought monitoring sites: PLOR4-4, -21, -22. Individuals were counted at the 12 sites.**

***Equisetum scirpoides* (Dwarf Scouring Rush)**

The recommendation is to remove this species from the R2-Sensitive Species List (14 of 24 sites had over 1000 stems in 2000). Survey and baseline monitoring information has been gathered on 24 sites on Forest Service-administered land within the Black Hills, and there is documentation on eight other sites. This species occurs on a variety of geological types, at different elevations, along drainages with varying aspects, and in different watersheds.

A primary risk identified for this species could be the invasion of *Lythrum salicaria* (purple loosestrife) into the sites located within riparian areas. *L. salicaria* is not currently known to occur at any of the sites (site information last updated in 2001) or anywhere close by, but if it invades any of the areas, it is very aggressive and has the potential to impact *Equisetum scirpoides*. Grazing does occur at some *E. scirpoides* sites, but direct or indirect effect to the plant is unknown as to whether it is beneficial, harmful, or both (due to depth of rhizomes, whether the disturbance may benefit establishment of the species, if the grazing is detrimental to riparian system in which the species occurs, etc.). However, data gathered provides good evidence this species is persisting in high numbers on enough sites to make a good case for a high probability of persistence.

Equisetum scirpoides is identifiable throughout the growing season, and monitoring could take place from the middle of May until the first of September.

Monitoring Design:

A presence/absence and estimate of aerial extent of three key populations will be used to monitor this plant species a minimum of once every five years. These three sites were chosen based on geographic distribution, large size and the potential for disturbance. If *Lythrum salicaria* (purple loosestrife) is documented to occur at any of the three locations, or the population is absent (i.e. due to flooding, drought, fire), then another of the known populations to serve as a key location for monitoring needs to be selected. *Lythrum salicaria* located at any key location will also serve as a “trigger” to check other known populations for this noxious weed.

Key monitoring locations of *Equisetum scirpoides*:

- EQSC-2 (Crow Peak Trailhead and part of population within Higgins Gulch BA – Northern Hills).
- EQSC-10 (Castle Creek - Mystic)
- EQSC-26 (Fawn Creek – Bearlodge)

No monitoring was required at any of the above sites in 2003 (monitoring occurred in 2001).

Sanguinaria canadensis (Bloodroot)



Photo by Reed Crook at *Sanguinaria canadensis* site SACA13-9, May 13, 2003.

Sanguinaria canadensis, occurring in the northern/northeastern Black Hills, is the one of the most abundant R2-Sensitive Species on the Forest. There were 22 known occurrences of bloodroot on Black Hills National Forest lands when a recent assessment was written for the species. Bloodroot occurs in hardwood forests, shrub thickets, and floodplain habitats. The species is considered secure on the forest at this time, but because of limited potential habitat and the number of sites with characteristics that lend themselves to noxious and other invasion, weeds and their treatment have been identified as a risk to this species. Bloodroots persistence on Forest Service-administered land is not currently at risk from livestock grazing, as nine sites are currently not grazed, and one site is not accessible to livestock. Timber harvest is not deemed a risk to bloodroot because occurrences are currently being avoided, mitigated, or designed to benefit the species. Collection (or illegal bloodroot harvest) is not currently an issue in the Black Hills, but due value as a medicinal herb could make harvesting detrimental.

The Forest has taken a conservative approach for this species and monitoring. The most recent data available were used in developing monitoring guidelines for the Black Hills National Forest. “Core” bloodroot occurrences were selected using the following four criteria: size (estimated number of individuals); geographic distribution of the occurrence; potential risk from livestock grazing; and community type. Thus, the largest estimated number of individuals observed at a given site was a primary factor used in delineating potential core occurrences. To incorporate geographic distribution, sites widely distributed from one another were selected over sites in close proximity to other occurrences. Sites in allotments currently not being grazed were selected over livestock-grazed sites. Finally, the selection of core sites included at least one in each vegetative community type associated with bloodroot occurrences. Based on these criteria, 11 core occurrences were selected. Of these 11 occurrences, 4 were designated as “key,” that is, occurrences of over 1,000 individuals deemed most critical to maintaining the bloodroot metapopulation on the Black Hills National Forest.

The proposed monitoring design involves assessing the status of the four “key” core occurrences on an annual basis. The monitoring is designed to address three questions: (1) is the species present, (2) is there evidence of plant collecting, and (3) have invasive plant species invaded the site? Although the monitoring focuses on the presence or absence of a given occurrence, a categorical estimate of each occurrence is also to be recorded.

The second aspect of the following monitoring direction is to provide baseline data on the extent of bloodroot occurrences on all 11 designated “core” sites and a reassessment of the status of each occurrence during a drought year. Our assumption is the high numbers of plants observed in 2001 were partially the result of

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several years of above-average precipitation. By documenting the size and extent of bloodroot occurrences during dry years, we hope to have a better understanding of the role precipitation levels play in the distribution and abundance of bloodroot. Any changes in the occurrence boundaries, evidence of plant collection, or the presence of invasive or noxious plant species will be documented at the time of follow-up surveys.

The third aspect of this monitoring design is to assess any additional changes in the extent of bloodroot occurrences following a second consecutive dry or below-average precipitation year. Information on the extent and change of bloodroot occurrences following two drought years is critical to consider in reassessing the current monitoring strategy. Information on the extent of occurrences in both wet and dry years will provide valuable data for re-examining and potentially changing the monitoring plan.

Monitoring Design:

1. Annually monitor presence/absence of the four key sites. Attempt to relocate *Sanguinaria canadensis* site SACA13-8. If relocated, gather baseline data and gather GPS data at the endpoints if the site is large (over ½ acre) or collect GPS points if the site is less than ½ acre.

***Sanguinaria canadensis* was present at all four key monitoring sites.**

Relocating SACA13-8 was not attempted.

2. During a drought year, collect GPS data of the endpoints of all “key” and “core” sites. If any key or core sites are absent, select another known site to monitor. During the second drought year and beyond, monitor presence/absence at all key and core sites. During the second non-drought year gather GPS data of the endpoints of all key and core sites. After the second non-drought year reassess the monitoring plan to determine future needs.

Core sites SACA13-4, -5, -9 and -10 were monitored during 2003 and were present. GPS endpoints were collected.

Core sites SACA13-6 and -7 were not monitored.

Relocating SACA13-8 was not attempted.

3. Document any weeds designated as noxious by South Dakota or Wyoming. Document if the weeds are co-located with *Sanguinaria canadensis*, or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type.

SACA13-1 – *Tanacetum vulgare* (common tansy) is abundant throughout the site in the same ecological type as *Sanguinaria canadensis*. *Hypericum perforatum* (St. Johnswort) is occasional, sometimes within the same ecological type. *Hypericum perforatum* occurs in conjunction with *Sanguinaria canadensis* at the north end of the occurrence. *Cynoglossum officinale* (Hound's tongue) occurs within the same ecological type but is infrequent.

SACA13-2 – No designated noxious weeds were documented in 2003.

SACA13-3 – *Tanacetum vulgare* (common tansy) is abundant on the north and east boundaries and is occasional on the south boundary of the *Sanguinaria canadensis* occurrence. *Tanacetum vulgare* co-occurs to a limited extent with *Sanguinaria canadensis*, but most occurs in wetter areas than where *Sanguinaria canadensis* is occurring at this site.

SACA13-14 - *Centaurea maculosa* (spotted knapweed) occurs on the northwestern margin of the *Sanguinaria canadensis* occurrence.

4. Document any evidence of *Sanguinaria canadensis* collection at the four key monitoring sites.

There was no evidence of collection observed at the four key sites at the time monitoring was completed in 2003.

Key Monitoring Sites for *Sanguinaria canadensis*:

- *S. canadensis* site SACA13-1 (District site number 99004; False Bottom site)
- *S. canadensis* site SACA13-2 (District site numbers 99007 & 99008; Lost Gulch site/Pillar Peak Allotment site)
- *S. canadensis* site SACA13-3 (District site numbers 94011 & 94018; Meadow Creek site)

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- *S. canadensis* site SACA13-14 (Park Creek site)

Core Monitoring Sites for *Sanguinaria canadensis*:

- SACA13-4 (District site number 93003)
 - SACA13-5 (District site number 93004)
 - SACA13-6 (District site number 95022)
 - SACA13-7 (District site number 94BC1)
 - SACA13-8 (District site number 94BC2)
 - SACA13-9 (District site number 93002)
 - SACA13-10 (District site number 94BC3)
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***Scirpus cyperinus* (Woolgrass, Woolrush)**

This species is being re-evaluated as to whether it continues to merit status on the R2-Sensitive Species List. If it continues to merit status, monitoring will occur on identified “key” populations on a periodic basis. This monitoring will cease if further evaluation reveals it no longer merits status on the R2-Sensitive Species List.

A primary risk identified for this species would be if drainages in which it is located were to be invaded by *Lythrum salicaria* (purple loosestrife). *Lythrum salicaria* (purple loosestrife) is not known to occur at any of the sites or anywhere close by, but if it comes into any of the areas, it is very aggressive and has the potential to impact *Scirpus cyperinus*.

Scirpus cyperinus is most identifiable August 15 to November 1. Monitoring needs to take place during this time frame.

Monitoring Design:

1. Monitor three key monitoring sites for presence/absence a minimum of once every five years.
2. If *Lythrum salicaria* (purple loosestrife) is documented to occur in or adjacent to any of the key locations, or if absence of a key location is documented, then select another key population for monitoring purposes. *Lythrum salicaria* (purple loosestrife) located at any key location will also serve as a “trigger” to check other known populations for this noxious weed.

Key monitoring sites for *Scirpus cyperinus*:

- SCCY-14 East end (area that contains 300+ clumps)
- SCCY-18 (Cook Lake Site)
- SCCY- 36 (Lucky Gulch)

No monitoring was required at any of the above sites in 2003 (monitoring occurred in 2001).

***Muhlenbergia glomerata* (Marsh Muhly)**

A number of new species sites of this species have been located. The majority of the newer sites are not located in riparian or boggy areas but on sites with a mesic moisture regime and on a variety of geological types. Therefore, *Muhlenbergia glomerata* has broader ecological amplitude in the Black Hills than

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previously thought. Because of the new information obtained on the species habitat preferences and the additional sites located, this species will be re-evaluated as to whether it continues to merit status on the R2-Sensitive Species List. If it continues to merit status, the following monitoring design will be used.

A primary risk identified for this species could be the invasion of *Lythrum salicaria* (purple loosestrife) into the sites located within riparian areas. *Lythrum salicaria* (purple loosestrife) is not currently known to occur at any of the sites (site information last updated in 2001) or anywhere close by, but if it invades any of the areas, it is very aggressive and has the potential to impact *Muhlenbergia glomerata*. More vigorous mats, or clumps, of this species were noted to occur in open areas without an overstory. Presence or absence or expansion and contraction of population sites are likely associated with climatic events.

Monitoring of *Muhlenbergia glomerata* needs to occur in August when it is the most identifiable.

Monitoring Design:

1. Monitor presence/absence of four key populations once every five years. These key sites were chosen based on geographic distribution and ecological amplitude. If one of the key populations is absent, document the reason for the absence if it can be determined (i.e. drought, flood, fire). Select another known or newly located site to serve as a key monitoring site.
2. If *Lythrum salicaria* (purple loosestrife) is documented to occur at any of the key locations for monitoring, and the persistence of population is lost, then another key monitoring site needs to be selected. *Lythrum salicaria* (purple loosestrife) located at any key monitoring site will also serve as a “trigger” to check other known populations for this noxious weed.

Key monitoring sites for *Muhlenbergia glomerata*:

- MUGL-9 (Corral Creek, Northern Hills Ranger District)
- MUGL-1 (McIntosh Fen, Mystic Ranger District)
- MUGL-4A (Planting Spring, Bearlodge Ranger District)
- MUGL-13 (Jasper Fire Area, Mystic Ranger District)

No monitoring was required at any of the above monitoring sites in 2003 (monitoring occurred in 2001).

Carex alopecoidea (Foxtail Sedge)

Based on recent confirmation (2000) of the identity of *Carex alopecoidea* and that it does occur on lands administered by the Black Hills National Forest, baseline data were gathered on this species in 2001. An estimate of linear extent, numbers of population patches and other baseline data were gathered at 14 known sites. With the likelihood more occurrences of this species were likely to be identified in late August and in consultation with the Rocky Mountain Research Station (January 2002), additional quick reconnaissance surveys were conducted in 2002 in similar habitat on the Bearlodge and Northern Hills Ranger Districts. Reconnaissance surveys resulted in 15 additional occurrences for *Carex alopecoidea* in the northwestern Black Hills and the Bearlodge Mountains. Based on the number of occurrences located in the two preceding years, the Forest suspects more occurrences are likely and this is reflected in the monitoring design.

The most recent data available were used in developing monitoring guidelines for *Carex alopecoidea*. Occurrences were primarily selected on the following criteria: size (estimated number of individuals), geographic distribution of the occurrence, and if occurrences were located in different drainages. To incorporate geographic distribution, sites widely distributed from one another were selected over sites in close proximity to other occurrences. Based on these criteria, five occurrences were selected for a portion of the monitoring. Because of the recent number of occurrences located, the second aspect of the monitoring design

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is to continue reconnaissance surveys to continue to learn more about the species for future status assessments or to refine the monitoring protocols.

Monitoring Design:

1. Gather baseline data on sites 20/20A, 22, 30, and 31. Count individuals and assess risks on site 18.

Site 20/20A was combined into site 20. Baseline data were collected at sites 20, 22, 30, and 31 in August 2003.

Data was not gathered on site 18.

2. Conduct quick reconnaissance surveys for *Carex alopecoidea* in similar habitat on the Bearlodge and Northern Hills Ranger Districts. If new sites are found, gather GPS data to pinpoint the location.

Two new *Carex alopecoidea* sites were located on the Bearlodge District. One occurrence was located through the quick reconnaissance surveys conducted in August and September 2003 with GPS data to pinpoint the location. The other occurrence was located through a project survey, and the location was documented on a topographic map.

3. Document any weeds designated as noxious by South Dakota or Wyoming. Document if the weeds are co-located with *Carex alopecoidea* or at what distance the weed species is located away from the occurrence site if they are occupying the same ecological type.

Site 20: *Cirsium arvense* (Canada thistle) and *Cynoglossum officinale* (Hound's tongue) individuals were found in patches and occur within the same ecological type as *Carex alopecoidea* within the drainage.

Site 22: *Carduus nutans* (musk thistle) is scattered but abundant and is both in and adjacent to the ecological type *Carex alopecoidea* occupies. *Cirsium arvense* is occasional within the same ecological type. *Cynoglossum officinale* is common and scattered within the same ecological type. *Tanacetum vulgare* (common tansy) was only within the enclosure at the west end of the site. *Carex alopecoidea* also occurs within that enclosure.

Site 30: *Cirsium arvense* and *Cynoglossum officinale* were patchy and occurs within the same ecological type as *Carex alopecoidea* within the drainage.

Site 31: *Carduus nutans*, *Cirsium arvense*, *Cirsium vulgare* (bull thistle), and *Cynoglossum officinale* occur within the same ecological type. *Linaria vulgaris* (toadflax) was in a drier ecological type up-slope of *Carex alopecoidea* individuals.

Monitoring Item 18d, 18i: Sensitive Bird Species

Objective 221: Conserve or enhance habitat for sensitive species and species of special interest (management indicator species) listed in Chapter Two.

Note: Three sensitive birds are also designated Management Indicator Species: black-backed woodpecker, American three-toed woodpecker, and northern goshawk. Please see Monitoring Item 26 on Management Indicator Species for all monitoring information on these dual status species.

Monitoring:

18d – Region 2 Sensitive Birds

In 2001, the Forest began funding the Rocky Mountain Bird Observatory (RMBO) to monitor long-term trends of bird populations through point-count transect surveys. The monitoring program is titled *Monitoring Birds of the Black Hills* (MBBH). Results are reported to the Forest annually (Panjabi 2001, Panjabi 2003). Ten habitats throughout the Forest are being monitored: white spruce, northern hills ponderosa pine, southern hills ponderosa pine, late-successional ponderosa pine, aspen, pine-juniper shrubland, mixed-grass prairie, montane riparian, foothill riparian, and burn area (mainly the Jasper Burn of 2000). Not all habitats will be monitored in all years, and adjustments may be necessary in habitat classifications and transect locations. The monitoring is designed to provide statistically rigorous population trend data on most regularly occurring diurnal (day active) breeding species in the Black Hills. Trends may not be discernable for rare species or those having highly variable occurrences; however, this monitoring program will provide insight into other population characteristics such as distribution and habitat associations.

In 2003, RMBO sampled 2,158 point-count stations along 152 transects in 5 habitats. The habitats were as follows: burn area, montane riparian, northern hills ponderosa pine, southern hills ponderosa pine, and white spruce. A total of 105 potential breeding bird species were detected. This is the third year of a long-term monitoring effort. The Forest is obtaining valuable preliminary data on species densities and habitat associations crucial to long-term trend detection so additional monitoring is planned.

Previous Forest Plan monitoring reports relied on the United States Geological Survey (USGS) Breeding Bird Survey (BBS) data to obtain population information for birds in the Black Hills. Due to the greater statistical rigor of the MBBH data, BBS data will no longer be reported except for rare species with very infrequent observations. Unless otherwise stated, the MBBH dataset is the primary data source for all birds discussed in this report.

Northern Harrier



Two harriers have been detected through MBBH efforts; both in very open habitats during 2001 (2000 Jasper Burn and Reynolds Prairie). Hell Canyon Ranger District biologist observed one harrier in 2003 in short-grass prairie. The harrier prefers non-forested habitats and is not known to breed or winter in the Black Hills due to limited availability of this habitat (Tallman et al. 2002). The recently observed birds could be transients, migrants, or nesters. Continued monitoring will help clarify the harrier's status in the Black Hills.

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Peregrine Falcon



The MBBH program has not detected a peregrine falcon since monitoring began in 2001. The species does not breed in the Black Hills and is considered an uncommon migrant and rare winter visitor (Tallman et al. 2002). Due to its infrequent occurrence here, monitoring is not expected to produce substantial new data for this falcon.

Yellow-billed Cuckoo



No yellow-billed cuckoos were observed through MBBH in 2003. The species has been recorded during only one year and in only one area. In 2002, three cuckoos were observed in a burr oak riparian area in the Bearlodge Mountains. The birds were not along an established transect, but instead were seen near a transect access point.

Flammulated Owl



One unverified report of a flammulated owl in the southern Black Hills was made during the early 1990s (Tallman et al. 2002). The species was not reported again until 2002, but this time the location was in the northern Hills. RMBO surveyors confirmed the second report through nighttime, non-protocol surveys. In 2003, the South Dakota Department of Game, Fish and Parks (SDGF&P) contracted biologists to monitor owls at the 2002 location and to inventory other potentially suitable habitat. The contractors were unsuccessful at locating any flammulated owls in 2003. The mixed results could mean flammulated owls occur here in very low density within very specific habitat types or only during migration or transient periods. Additional nighttime inventories and monitoring will be needed to clarify the status of flammulated owls in the Black Hills.

Burrowing Owl



No burrowing owls have been observed on the Forest during MBBH or other efforts. The species is considered rare in the Black Hills (Tallman et al. 2002) and is most likely to be seen within prairie dog towns near the edge of the hills (e.g., in Wind Cave National Park). Although the Forest houses a few small prairie dog towns, burrowing owls have not been observed within them. Monitoring is not expected to produce substantial new data for this owl because it rarely occurs here.

Lewis's Woodpecker



Nine Lewis's woodpeckers were detected during 2003 MBBH efforts. All observations were within burned areas. This is the largest number of Lewis's woodpeckers observed in the Black Hills since the start of the MBBH program. This species prefers nesting in older snags (dead trees) more than younger snags (Anderson 2002); therefore, population trend is expected to increase as the age of the burn increases. Several more years of data will be necessary to detect a meaningful change should one occur.

Black-backed Woodpecker

See Monitoring Item 26 Management Indicator Species.

American Three-toed Woodpecker

See Monitoring Item 26 Management Indicator Species.

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Loggerhead Shrike



No shrikes were observed through MBBH during 2003. Hell Canyon Ranger District biologist observed one loggerhead shrike this year in open grassland habitat. In fact, the species has only been recorded during the first year of the MBBH program. In 2001, one individual was observed in riparian habitat, and a second bird was seen in shrub habitat.

Grasshopper Sparrow



The grasshopper sparrow appears to use the Black Hills variably from year to year. No sparrows were detected during 2003 MBBH efforts, but in 2002 75 individuals were observed across several habitat types. In 2001, only six birds were observed. This species may occur in the Black Hills most often during drought years when typical breeding areas are less suitable (Panjabi 2003). Additional monitoring is needed to clarify population dynamics for this species.

18i. – Northern Goshawk

See Monitoring Item 26 Management Indicator Species.

Monitoring Item 20a: Pine Beetle Susceptibility

Objectives:

- 228. Within planning units (diversity unit, watershed and/or landscape association) where outbreaks of mountain pine beetle could threaten management objectives for ponderosa pine (especially where timber production is desired), maintain or reduce acreage of ponderosa pine stands that are in medium or high risk condition for infestation.**
- 229. Using analyses of insect and disease populations, determine where suppression strategies are needed to meet management objectives and minimize value loss of tree vegetation affected by outbreaks of insect and disease pests.**

Monitoring:

Timber stands in the Black Hills can be hazard rated for mountain pine beetle (MPB). The most current and well-tested system is based on Schmid et al. 1994. In this system, each stand is rated based on average diameter and stand density. Stands with an average diameter of less than 7.0 inches are rated as low hazard. Stands with an average diameter of greater than 7.0 inches are then sorted based on density. All Forestwide stands were rated using data from the Resource Information System (RIS) database available in 2000 for this year's report. This data indicated there were 1,040,000 acres of susceptible type (ponderosa pine) on the Forest.

Hazard Rating	Density (Basal Area)	Acres	Percent of Area
Low	< 80 BA	610,340	59%
Moderate	80-120 BA	333,320	32%
High	120 BA	96,340	9%

The recent fires across the forest will lower mountain pine beetle hazard in these areas; however, they can lead to an expansion of pine engraver and woodborer populations in these areas. Pine engraver populations are killing green trees in larger numbers than has been seen in recent history due in part to fires' creation of large habitat areas and magnified by less-than-average moisture. Woodborer populations are also at high levels. Borers are rapidly attacking and infesting dead trees. Prompt dead tree salvage is needed as these insects are quickly degrading lumber value. A study of beetle use of fire areas in the Black Hills is continuing. In addition, areas that experienced heavy MPB mortality over the past few years, such as Beaver Park, may no longer have enough live host material to sustain MPB populations. Beetles are spreading out from these areas and infesting nearby stands.

In areas where beetle activity was increasing and stands were harvested as part of a timber sale, beetle activity had dropped. Timber sales and other commercial contracts are the most financially efficient method of treating a landscape because the tree value supplements available funding.

MPB infestations are continuing to spread along with those of other insects. Previously the Forest's ability to manage for reduced insect risk was limited due to funding, the time it takes to set up a timber sale or other treatment project, legal considerations (NEPA process), and contract length. The situation is improving with increased funding, changes in legal and policy requirements, and industry cooperation.

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Objective 229:

Evaluations have led to suppression projects being undertaken in campgrounds and the following planning areas: Beaver Park, Bear Mountain, Coulsen, and Deerfield.

An aerial survey was conducted in August 2003 to estimate damage levels caused by bark beetles, MPB, and *Ips* on ponderosa pine. A rough estimate of approximately 395,000 trees killed by bark beetles in 2002 showed as red faders in the survey.

A long-term study has been initiated to examine the flight periods and most effective lure chemistry of adult mountain pine beetle and pine engraver beetle.

On-the-ground surveys are being conducted to estimate the level of infestations and how they have changed over the past four years.

A study of beetle use of fire areas in the Black Hills is continuing.



Mountain Pine Beetle

Monitoring Item 20b: Pine Beetle Levels and Trends

Monitoring:

An aerial survey was conducted in August 2003 to estimate damage levels caused by bark beetles, mountain pine beetle (MPB), and *Ips* on ponderosa pine. The survey indicated approximately 395,000 trees were killed by bark beetles in the Black Hills, totaling an estimated 8 million cubic feet of volume. MPB mortality is starting to rival some of the historic levels from the twentieth century. The largest outbreak in the Black Hills occurred from about 1890 to 1908 with mortality estimated at close to one million trees killed per year at the peak of the outbreak. The next largest outbreak occurred in the 1970s with peak mortality numbers of around 600,000 trees killed in a single year. The predicted expansion of the beetle population projected for 2003 is approaching the 1970s outbreak estimates. Many of the infested areas are being treated, which should help reduce tree mortality. Large areas of concentrated mortality were detected in Beaver Park, Vanocker Canyon, Kirk Hill, areas south and west of Bear Mountain, around the Ditch Creek area, areas west of Deerfield, Warren Peak, and the Boles Canyon area.

Over the past years tree mortality has been considerable when you add the mountain-pine-beetle and fire

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mortality to the general background mortality from root disease and other sources. Varying insect-caused tree mortality has occurred on approximately 200,000 acres; that is not to say all 200,000 acres have dead trees, but an extensive range from a few trees to a large number in a stand has succumbed to insects.

Monitoring Item 20c: Insect and Disease Evaluations

Monitoring:

Biological evaluations of mountain pine beetle-caused mortality were conducted in the Beaver Park, Deerfield, Custer Peak, Warren Peak and Nemo areas and consisted of on-the-ground surveys to estimate infestation levels and change over the past three years. Based on the ground surveys, beetle-caused mortality is increasing at Beaver Park, Deerfield, and Custer Peak. Beetle populations are relatively static at Warren Peak and Nemo. Beetle populations seem to be increasing at roughly a two-to three-fold rate in the areas where an increase is noted.

A long-term study has been initiated to examine the flight periods and most effective lure chemistry of adult mountain pine beetle and pine engraver beetle. Baited funnel traps were checked weekly throughout much of 2003 to determine when the beetles began flying and when they stopped. This study will take several years to account for the year-to-year variation in flight periods environmental factors caused. Other studies are looking at alternative control measures for mountain pine beetle. Testing the effectiveness of different preventative sprays against mountain pine beetle is ongoing. Two chemicals tested are effective at protecting trees from attack for one season, and one may be effective for two seasons. These insecticides are effective for treating individual trees in isolated areas but are not practical for widespread use. Some of these chemicals may not be available for forestry uses in the near future, so there is a continued need for further evaluation of suitable replacement chemicals.

Other Insects and Diseases of Interest:

Red Turpentine Beetle and Wood Borers.

Over the past few years, there has been a noticeable increase in activity of red turpentine beetle (*Dendroctonus valens*) and wood boring insects (beetles in the families Cerambycidae and Buprestidae). Neither of these groups of insects are typically considered tree killers; however, they can do damage to wood products.

Red turpentine beetle is generally found infesting heavily damaged or stressed trees and fresh-cut stumps. They carry blue stain fungus, which generally degrades wood quality. Since this beetle is rarely a tree killer, long-term monitoring data has not been collected. However, the recent increases in tree mortality caused by wind-damaged trees, mountain pine beetles, and fires have created conditions allowing this beetle to flourish. Increases in tree mortality in healthy trees have not been detected, but certainly some trees scorched in fires and later infested may have died prematurely. In 2003, we started looking at a series of different chemicals for use in pheromone traps for red turpentine beetle. The best mix of chemicals is unknown, and with improved technology, mass trapping may be one technique for controlling this insect in select areas.

Wood boring insects have also increased greatly across the Forest over the last few years. Their increased population also coincides with storm damage, fire damage, and mountain pine beetle-caused mortality. Although these insects do not typically kill trees, they have attacked fire-scorched trees that still have green

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crown, which may be leading to more mortality in these areas than would be expected. Boring insects also play a large role in lumber quality. These insects cause serious degradation of lumber because they actually bore into the wood of a tree as opposed to just living under the bark, as do bark beetles. Over the past few years trees have died and become infested with borers so rapidly that in some cases, the trees did not hold lumber value for more than two to three months after they were killed. A series of traps and tests were started in 2003 to determine general numbers (populations) in some burned areas and to determine which species of borers are most common in the Black Hills.

Armillaria Root Disease:

Armillaria root disease is common throughout the Black Hills on all tree species found here, conifers and hardwoods alike. Typically, it is not considered a killer of large trees; however, it does kill seedlings and saplings regularly. In larger trees, it acts more to reduce growth rates and stress the trees, which can make them more susceptible to bark-beetle attack. In the general forest, the disease can be found almost anywhere; however, it appears there are root disease centers or places where it may be more of a problem. Known areas of greater Armillaria activity or root disease centers include the Bearlodge Mountains, Medicine Mountain, and generally the Limestone Plateau. Armillaria is a concern in areas that experienced fires as the large quantity of weakened trees may lead to an increase in these areas. Armillaria could kill some trees that may have otherwise survived. A series of plots were established in the Jasper Fire area to look at how Armillaria responds to wildland fire.

Overall, the above factors generally do not lead to large-scale tree mortality; however, conditions on the Forest over the past few years have led to rising populations and concerns. All of the above factors certainly do play a role in the Forest. They are important in creating snags and providing other wildlife benefits such as being used as a food source. Continued high levels of mortality across the Forest will make these insects and diseases a continued common occurrence. Monitoring efforts will be continued as long as they persist at higher than normal levels.

Effective and economical pheromone or chemical treatments for widespread use on the Forest to reduce or eliminate pests have not been found. Some existing chemical methods that protect individual high-value trees may no longer be legal to use on the Forest in the future. The Forest is currently experiencing large population increases in mountain pine beetle, pine engraver, red turpentine beetle, and woodborers. Whether or not armillaria is expanding in burned areas is unknown at this time. There are major changes taking place across the Black Hills landscape.

Monitoring Item 21: Exotics

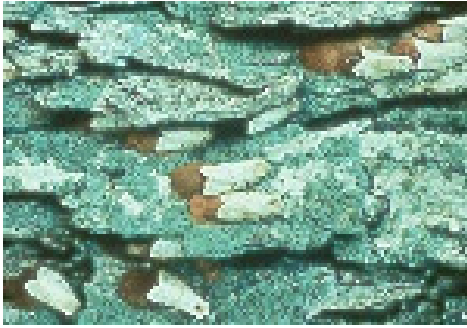
Objective 230. Eradicate or limit spread (acres) of new introductions of non-native pests (insects, diseases, plants) to minimize ecosystem disruption.

Monitoring:

Gypsy Moth.

Detection surveys for the gypsy moth were continued at recreation and administrative sites on the Forest in 2003. No moths were caught in recreation sites on the National Forest; however, in 2003 moths were caught in surrounding private campgrounds near the National Forest. It is assumed most of these are transient, and there is no local population established at this time. See also Monitoring Item 19 noxious weeds.

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Gypsy Moth Eggs



Gypsy Moth Larvae



Gypsy Moth Adult

***Scolytus schevyrewi* – the banded elm bark beetle.**

This insect was discovered for the first time in Colorado and adjacent states through the exotic bark-beetles program's rapid detection managed jointly by the Forest Service and the Animal and Plant Health Protection Service. The insect is native to Asia where it is a pest of elms and a number of other broadleaf trees.

Since its discovery, the banded elm bark beetle has been found in all states in Region 2. In South Dakota, it has been found in Pennington County. This insect has also been found in Arizona, California, Idaho, Illinois, New Mexico, Oklahoma, and Utah. In Kansas a gradient exists with high numbers of *S. schevyrewi* in the west and few individuals of this species in the eastern part of the state.

S. schevyrewi is likely to become a significant pest problem of ornamental elm plantings and of Siberian elm windbreak plantings in the inland West and Midwest.

Gypsy moth has not been a problem on the Black Hills National Forest. The need for continued monitoring of this introduced pest is warranted. *S. schevyrewi* is a bark beetle that was found for the first time last year, including in areas surrounding the Black Hills. Its main hosts are elms, however, it is reported to attack Russian olive, willows, and many stone fruit trees. Whether it would be a concern on the Forest or not is questionable.

Monitoring Item 22: Fuel Loading Hazard

Objective: 224. Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area, using the criteria in Forestwide Standard 4110.

Monitoring:

The combination of all fuels influencing activities accounted for an estimated 196,000 tons of 3 inch and less diameter fuel residue being treated in accordance with Forest Plan required treatment standards.

All activities which generate fuels (reference Monitoring Item 23: FIRE - Fuel Treatment) require an assessment to determine appropriate fuel treatment as outlined by Land and Resource Management Plan (LRMP) Guideline 4110 (p. II-55, LRMP). This assessment and prescribed treatment insure on-site fuel hazards either remain at pretreatment levels or are reduced as necessary based on risk and/or values present.

Of the 29,214 acres of fuel reduction activities (see Chart - Monitoring Item 23), nearly 60 percent of it occurred in areas identified in the Black Hills National Forest Fire Protection Assessment (FPA) as having a high hazard index. Prescribed treatments in these areas reduced the hazard index to moderate or low levels. Less than five percent of fuel-treatment activities occurred on areas of the Forest where the FPA rated existing fuel "hazards" low. Fuel treatment on the balance of the activity acres occurred on areas identified by the FPA as having a moderate hazard index. Prescribed treatment in these areas either reduced the hazard index or resulted in no change to the hazard index based on the fire "risk" or "values" present. Continuing drought conditions over the Forest in 2003 again contributed to wildland fire activity well above the Forest average. In all, 11,666 acres of the Forest burned. This acreage, which accounts for approximately .9 percent of the total Forest, significantly reduced fuel-hazard ratings in the burned-over areas. Based on the combined effects of fuel-treatment and wildland-fire activity, an estimated 29,043 acres of the Forest moved from a high-hazard index to a moderate or lower-hazard fuel profile. In addition, an estimated 11,837 acres of the Forest moved from a moderate-to-low hazard-fuel index. In any given year, untreated or unburned areas of the Forest currently rated as being in a moderate fuel-loading index will move into a high-hazard rating due to natural fuel deposition. However, the net decrease of high-hazard fuel acres on the Forest in 2003 is estimated at approximately 10,900 acres.

High Hazard Acres

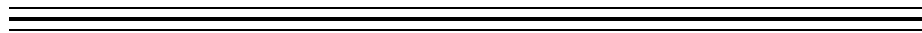
LRMP Baseline (Decade 1)	LRMP Baseline (Decade 2)	1998	1999	2000	2001	2002	2003
580,434	519,274	564,561	547,744	489,244	476,744	466,344	455,444

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Evaluation:

The Forest has reduced high fire-hazard acres from 580,434 acres to 455,444 acres, a 22 percent reduction in 6 years. The Forest is not meeting prescribed burning objectives because of the following: funding limitations; limited days when the weather is favorable for maintaining control of the prescribed burn; unacceptable smoke dispersal conditions; and wildland fire acreage.

Accomplished (Acres)	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003
Objective 227: Fuel Treatment Activities	26,455	28,029	28,475	25,598	26,288	29,214
Objective 223: Prescribed Fire Activities	1,633	1,830	2,600	1,073	1,433	3,481



Monitoring Item 23: Fuel Treatment

Objectives:

- 223. Use management ignited fires and prescribed natural fires to achieve desirable vegetative diversity and fuel profiles on 8,000 acres per year for the next decade. Use natural fire on a limited basis under specifically prescribed conditions.**
- 224. Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazard (fuel flammability), and land and resource values common to the area, using the criteria in Forestwide Standard 4110.**
- 227. Manage 28,900 acres of activity fuels and 4,000 acres of natural fuels each year during the next decade, consistent with the need to protect life, property and natural resources from the threat of wildfire. This acreage includes acres specified in Objective 223.**

Monitoring:

The Forest accomplished fuel-treatment-related activities on a total of 29,214 acres of the National Forest in FY2003. Included in this work were activities as listed below:

Fuel Treatments (Measured in Acres)	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003
Pile Creation:	1,454,	595	1,056	879	1,233	1,269
Pile Burning:						
Natural Fuels	476	262	855	58	2,247	1,598
Activity Fuels	2,230	1,430	1,116	1,444	303	500
Prescribed Burning	1,633	1,830	2,600	1,073	1,433	3,481
Slash Removal	201	76	47	1,824	90	190
Urban Interface Thinning and Piling	28	111	560	3,718	15	103
Lop/Scatter/Chip/Crush (force account)	1,467	1,687	1,456	25	692	6,464

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Fuel Treatments (Measured in Acres)	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003
Pine Encroachment and Disposal	2,208	1,220	431	675	579	714
Pre-commercial Thinning and Associated Fuel Treatment	9,247	4,579	7,003	3,095	3,902	5,286
Aspen Regeneration	470	520	409	131	97	79
Purchaser Contribution - Lop and Scatter/Removal/Mech. Crush	7,041	6,027	12,967	12,515	15,697	9,331
Fuel Break Construction - associated with and included in the above acres	354	524	384	161	0	199

(See 2002 Forest Summary Silva Report as extracted from Rocky Mountain Resource Information System [RMRIS] database and NFPORS 2003 Summary).

Much of the above acreage is associated with the Forest's active timber sale program.

Evaluation:

The Forest has accomplished the following:

- 95 percent of all activity fuel treatments projected in the 1997 Plan (28,900 acres/year).
- 25 percent of all management ignited fire fuel treatments projected in the 1997 Plan (8,000 acres/year).
- 73 percent of all management ignited fire natural fuel treatments projected in the 1997 Plan (4,000 acres/year).
- 66 percent of all management ignited fire activity fuel treatments projected in the 1997 Plan (4,000 acres/year).

Monitoring Item 24a: Suppression

Objective 225. Manage wildfires using the appropriate suppression response (confine, contain or control) based on management area emphasis, existing values, risk of ignition and fuel hazards within a given area.

Monitoring:

The Black Hills National Forest experienced a below average fire occurrence year in 2003; however, acreage burned was well above the 40-year average. There were 96 fires during the 2003 fire season, which was well below the Forest average of 139. There were 81 lightning-caused and 15 human-caused fires with both ignition sources well below the respective annual norms of 101 and 38. The drought conditions of the previous three years continued into 2003 causing associated control problems during initial-attack-suppression activities. In all 11,666 acres of the Forest burned in 2003. While fire and fire-related issues continued to dominate the Forest scene in 2003 there was only one escaped fire on the Forest. In July the lightning caused Red Point Fire burned 17,500 acres to the south and east of Newcastle, Wyoming. Of the

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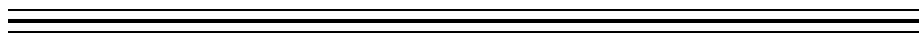
total acres burned, 10,773 were on the National Forest. Since the fire burned in a relatively remote location there were few Urban Interface issues. Resource losses were confined primarily to the low- or marginal-valued-timber resources that exist in this area of the Forest.

The Forest completed a revision of its National Fire Management Analysis System (NFMAS) data in 1999. That revised analysis and associated fire modeling places projected annual losses at 3,253 acres with a suppression budget funded at the most efficient funding level (MEL). The suppression program for FY2003 was funded at approximately 90 percent of the revised MEL budget level. Recorded losses (2003) were significantly above the norm and well above the NFMAS projections. However, based on the funding level, losses are considered within the statistical variation of historical fire records/data. All fire reports have been submitted and entered into the FIRESTAT Database at Kansas City.

Evaluation:

All wildfires on the Black Hills National Forest were suppressed through appropriate suppression responses in accordance with management area emphasis, existing values, and fuel hazards within the incident area.

Confined: All Contained: All Controlled: All



Monitoring Item 24b: Prevention

Objective 226. Develop fuel management and protection strategies for intermixed landownerships in partnership with private, state and other federal agencies.

Monitoring:

Indicators: Interagency involvement and or assessment of the following items:

- Status of fire management agreements with partner agencies;

All cooperator agreements and annual operating plans were reviewed and signed as required in 2003 with the exception of the Annual Operating Plan with the State of South Dakota which tiers to the State and Federal Interagency Cooperative Fire Agreement. The 2003 governor of the State of South Dakota had refused to sign any agreements with Federal Fire Management Agencies.

- Involvement in interagency fire training exercises;

The Forest continues to play a lead role in interagency fire training by providing qualified instructors, financial support, and course coordination for much of the fire training offered in the Black Hills and surrounding areas.

Agencies cooperated in hosting one large Basic Fire School (S-190, 130, etc.) session in 2003. This session was held at the Western Dakota Vocational Technical Institute located in Rapid City, South Dakota. The Institute provided classrooms, student registration, and all administrative coordination of the training while various Federal, State and local cooperators provided instructors. The Institute has elected to be a partner in this annual fire training in the Black Hills and we are planning to utilize their facility for future training initiatives. They have also elected to offer course credits for the fire training as part of their school curriculum and are working to establish an accredited Technical Fire Science Program at the school.

- Involvement in South Dakota Interagency Fire Council (SDIFC) meetings and activities;

The Forest is a member of the SDIFC and an ad hoc member of the Black Hills Fire Advisory Board

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(BHFAB). Both of these organizations provide interagency coordination of prevention, pre-suppression, and suppression activities in the Black Hills and surrounding areas. The Forest has representation at all meetings and participates in and provides representation to various committees and task groups of these two active organizations.

- Effectiveness of the Custer Interagency Dispatch Center (the Custer Center no longer exists having been relocated to a new Center at Rapid City Regional Airport) as assessed by fire management partners;

The year 2003 saw the inaugural year of the newly established Northern Great Plains Interagency Dispatch Center (GPC) located at Rapid City Regional Airport. The GPC performed well in the face of many challenges during this first season. Included among these challenges were the following: the initial year of the Resource Ordering and Status System (ROSS); a new Forest radio system coming on-line progressively from June through August; all new GPC employees; full interagency operation with centralized initial-attack dispatching for area agencies; transition to state-of-the-art dispatching hardware/software; and combined state(s) and federal agencies expanded-dispatch operation.

The GPC Manager and staff performed exceedingly well given all the challenges they faced during the year, which included a dispatching workload well above the norm.

- Assessment of suppression support afforded partners through Incident Command System (ICS) process and as might be identified through post fire reviews, reports, or exit conferences; and
- All other information, which might cast light on the Forest's record of performance related to efficiency of operation in the fire management arena through interagency cooperation and prevention activities.

The Forest completed reviews of various fire incidents during the course of the 2003 fire season in compliance with findings and abatement requirements of the Thirty-Mile incident.

There was one out-of-area Type II Incident Management Team assigned to an incident on the Forest in 2003 (Red Point Fire). The Forest and cooperators received very positive remarks from the Type II Team that took over management of the Red Point Fire both at the initial administrative briefing and at the close out meeting regarding initial management of the incidents by the Black Hills Interagency Type III Team and with regard to support of their team after arrival.

Evaluation:

The Forest has extensively cooperated with private, state, and other federal agencies to develop joint fuel management and protection strategies for intermixed landownership in partnership with private, state, and other federal agencies.

Monitoring Item 25: Threatened and Endangered Wildlife

Objective 220. Conserve or enhance habitat for federally listed threatened, endangered and proposed species.

Monitoring:

Threatened and Endangered Species



The bald eagle is the only threatened (T) or endangered (E) species with documented occurrence or suitable habitat in the Black Hills; therefore, it is the only T or E species the Forest monitors.

The bald eagle winters in and migrates through the Black Hills but does not breed here. From October through March, eagles can frequently be seen feeding on road-killed deer, perched near lakes or streams, or soaring in the sky. The Forest monitors the species by recording sightings during normal work activities (i.e., incidental observations). This non-standardized methodology may result in highly variable numbers that may not reflect actual population trends.

The table below shows the number of bald eagles observed on each district over the past five years. Observations have been variable, with 2003 representing an all time high.

District	Number of Annual Bald Eagle Sightings				
	FY1999	FY2000	FY2001	FY2002	FY2003
Bearlodge	15	0	0	15	15
Hell Canyon	12	14	5	9	5
Mystic	51	24	22	51	>55
Northern Hills	4	9	0	0	23
Total Forest	82	47	27	75	>98

Monitoring Item 26: Habitat Capability Relationships, including Management Indicator Species (MIS) for Wildlife

Objectives:

- 217. Maintain habitat for game and fish populations at the state objectives in effect in 1996.**
- 218. Conserve or enhance habitat for resident and migratory non-game wildlife. Increase habitat capability for species when recommended in project level analysis.**
- 219. Maintain or improve instream fisheries habitat. Cooperate with state agencies in aquatic ecosystem improvements to meet mutually agreed-upon objectives.**
- 221. Conserve or enhance habitat for sensitive species and species of special interest (management indicator species) listed in Chapter Two.**

Some of the Forest's Management Indicator Species (MIS) are also sensitive species. For reading ease, all species with both sensitive and MIS status are discussed in full within this section.

GAME ANIMALS

Monitoring:

Rocky Mountain Elk



The Custer Expedition reported numerous elk sightings in the Black Hills during 1874. The subspecies present at that time was the Manitoban elk. By 1888, elk were extirpated from the Black Hills. The larger Rocky Mountain subspecies was reintroduced in the early 1900s and is present in the Black Hills today.

The Forest Plan (Objective 217) supports habitat management for 3,850 elk in South Dakota and 500 in Wyoming (USDA Forest Service 1996 p. 349). These figures match the respective state wildlife agency population objectives held in 1996. The Black Hills elk population has exceeded both objectives and has been increasing in both states over the past several years. The most recent estimate (2002) by the South Dakota Department of Game, Fish and Parks (SDGFP) was 4,190 animals (see table below). The state has not revised the population estimate for 2003, but the number of licenses sold (1,579) and resultant elk harvest (1,056) in 2003 reflect large populations, as these statistics were higher this year than in any other year since at least 1997. The Wyoming Game and Fish Department (WYGFD) does not have a rigorous Black Hills population estimate or population model, but their best estimate is that 1,500 to 2,000 elk occur within the Black Hills elk hunt units (Sandrini 2004). This estimate includes animals that freely cross the Wyoming-South Dakota border, so some double counting could occur. The Wyoming Black Hills hunt units include a large amount of private land, further reducing the number of animals thought to use National Forest System lands in that state.

Both state game agencies acknowledge elk numbers are higher than desired in some areas of the Black Hills, and have responded by increasing license sales and extending hunting seasons. Over 1,000 elk were harvested from the South Dakota Black Hills in the 2003-hunting year compared with less than 550 in 1998. A total of 339 elk were harvest in Wyoming Black Hills units during 2002 compared to 205 harvested in 1998. 2003 harvest figures are not yet available from the WYGFD.

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Elk	Year				
	1998	1999	2000	2001	2002
Population Estimate ¹	2,735-3,000	3,440	3,895	4,155	4,190

¹Estimate applies to Black Hills N.F. land within South Dakota only, and excludes data from Custer State Park, Wind Cave National Park, private lands, and Black Hills N.F. land in Wyoming.

The HABCAP model was used to compare Forestwide habitat capability values from 1997 with data from 2002. Summer habitat values increased from 66 to 69 percent, and winter values increased from 62 to 63 percent, indicating elk habitat has slightly improved or remained stable over the last five years.

The Forest is involved in a cooperative elk study being conducted by the Rocky Mountain Research Station. Other partners include the SDGFP and the Rocky Mountain Elk Foundation. A principal objective of the study is to validate the elk habitat relationship model, which will yield better predictive information on the effects of habitat change on elk use and numbers. Fieldwork was scheduled through 2002, but a final report is not yet available.

Evaluation:

Increases were observed in both elk population and habitat capability (albeit slight) over the past five years. The Forest has surpassed Objective 217 in South Dakota by providing enough habitat for a nine percent population increase over state objectives. Increased habitat capability values indicate the Forest has also met Objective 221.

Monitoring:

White-tailed and Mule Deer



Forest Plan Objective 217 supports habitat management for 60,000 deer of both species combined in South Dakota. This figure matches the SDGFP population objective for the Black Hills (USDA Forest Service 1996 p. 349). The WYGFD has not set a specific Black Hills population objective. Neither state agency has released 2003 population estimates; therefore, 2002 data are reported here. The South Dakota white-tailed deer population is approximately three times larger than the mule deer population and has increased nearly 17 percent between 1998 and 2002. The mule deer estimate has been decreasing the past three years and is currently 1,000 animals (10%) lower than it was in both 1998 and 2000. The

combined deer populations have never reached the SDGFPs objective and are currently 14,000 animals (23%) under objective. Both species are heavily influenced by hunter harvest. But according to SDGFP harvest reports, nearly twice as many deer licenses were available in 1997 than in 2002. Regardless, deer are abundant in the Black Hills and are commonly seen in towns and along roadways.

Deer	Year				
	1998	1999	2000	2001	2002
White-tailed Deer Population Estimate ¹	30,000	28,000	29,000	30,000	35,000
Mule Deer Population Estimate ¹	12,000	13,000	12,000	10,000	11,000
Total Deer Population Estimate ¹	42,000	41,000	41,000	40,000	46,000

¹Estimates apply to Black Hills N.F. land within South Dakota only, and excludes data from Custer State Park, Wind Cave National Park, private lands, and Black Hills N.F. land in Wyoming.

The HABCAP model was used to compare Forestwide deer habitat capability values from 1997 with data

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from 2002. Summer white-tailed deer habitat values increased from 54 to 61 percent, and winter values decreased slightly from 59 to 58 percent. Both summer and winter values increased for mule deer (73 to 77 percent and 63 to 65 percent respectively). These data indicate summer habitat has increased and winter habitat has remained relatively stable ($\pm 2\%$) for both species in recent years.

Evaluation:

Deer populations have been relatively stable over the last five years although they have fallen short of SDGFP deer objectives by 23 percent. Habitat capability values have increased or remained relatively stable for both deer species during both major seasons. Assuming the HABCAP model reasonably portrays habitat conditions, monitoring data suggests habitat is not currently limiting population growth and the Forest is meeting Objectives 217 and 221.

Monitoring:

Turkey



Forest Plan Objective 217 supports habitat management for 20,000 to 30,000 turkeys in South Dakota. Wyoming did not set specific Black Hills population objectives (USDA Forest Service 1996 p.340). Wild turkeys were historically known to occur in South Dakota until about 1920 (SDGF&P Wildlife Survey Manual, 1998-2003). Small transplants began in 1948 and continued through 1951. The population reached approximately 10,000 to 15,000 birds in the early 1960s and again in the late 1980s. Until the mid-1990s, populations were reduced substantially (approximately 3,000 birds) due to weather conditions affecting reproduction. Since 1995, turkey populations have been increasing and are currently at an all-time high in South Dakota (see table below) and a 15-year high in Wyoming (Sandrini 2004). The most recent (2002) South Dakota population estimate is more than twice as large as in 1998. Weather and hunting pressure are probably the primary factors affecting reproduction and population size.

Turkey	Year				
	1998	1999	2000	2001	2002
Population estimate ¹	9,000	15,000	16,000	17,000	18,500

¹Estimate applies to Black Hills N.F. land within South Dakota only, and excludes data from Custer State Park, Wind Cave National Park, private lands, and Black Hills N.F. land in Wyoming.

The HABCAP model was used to compare forestwide turkey habitat capability values from 1997 with data from 2002. Summer habitat capability increased slightly from 64 to 66 percent, and winter values remained constant at 64 percent.

Evaluation:

Turkey populations are increasing in the Black Hills. The Forest is nearing the lower end (within 8 percent) of the population objective for turkey in South Dakota. Habitat capability values have remained fairly stable (0 to 2 percent change), indicating habitat is not likely a limiting factor in population growth. Both population and habitat trend data suggest the Forest is meeting Objectives 217 and 221.

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Monitoring:

Mountain Goats



Mountain goats are not native to the Black Hills. In 1924, six goats were introduced in Custer State Park from Rocky Mountain Park in Alberta, Canada (*Wyoming Wildlife*, August 1940). Shortly after their arrival, a few individuals escaped and established a population on the Forest. By 1940, approximately 25 animals were observed on Harney Peak.

According to the SDGFP 2002 County Wildlife Assessments (Game Report No. 2003-11), mountain goat populations have been stable in the Black Hills over the past five years. The 2003 report is not yet available. The State's population objective is unknown.

Mountain Goat	Year				
	1998	1999	2000	2001	2002
Population estimate	168	163	163	163	168

A HABCAP model has not been developed for mountain goat habitat capability. However, it is likely habitat has remained relatively stable because mountain goats in the Black Hills are associated with cliffs in the Black Elk Wilderness and Norbeck Wildlife Preserve, and relatively few management practices occur in these areas.

Evaluation:

Mountain goat population and habitat trends are stable. The Forest is achieving Objective 221.

Monitoring:

Mountain Lion



Mountain lions are currently being studied in a joint research project funded by SDGFP and South Dakota State University. This study will analyze the territory size and estimate population dynamics of mountain lions in the Black Hills. The research indicates approximately 48 to 72 adult mountain lions currently reside in suitable habitat in the Black Hills (Fecske, unpublished data in SDGFP 2003). When sub-adults are considered, 130-150 animals are thought to reside here (Thompson in Najacht 2004). Mountain lion

sightings (adults and kittens) have increased over the past five years and are most common in the southern counties (i.e., Custer and Fall River). The SDGFP believes the mountain lion population has increased since the animal was classified as a state threatened species in 1978. In 2003, a bill was passed in the state legislature to change the state status from threatened to big game. This will allow the SDGFP more management flexibility while maintaining protection from illegal taking.

A HABCAP model has not been developed for mountain lion habitat capability. However, models do exist for white-tailed deer, mule deer, and elk, which are major prey species of lion. HABCAP results for those species indicate stable to increasing habitat capabilities.

Evaluation:

The mountain lion population is stable to upward. Prey habitat has been stable to increasing. It appears the Forest is meeting Objectives 217 and 221.

NON-GAME MAMMALS

Monitoring:

American Marten



Marten historically occurred in the Black Hills, but native populations were lost by the mid-1900s (Buskirk 2001). During the 1980s and 1990s, the SDGFP reintroduced a total of 125 animals into the Black Hills. Numerous sightings over the years indicated the population had become established by 1995. A study conducted between 1999 and 2002 clarified habitat use and population characteristics of marten in the Black Hills. Results show the species occupies two main areas of the Black Hills: one in the northern Hills around Deadwood and the other in the east-central Hills around Norbeck Wildlife Preserve (Fecske 2003). Major habitat associations include mature dense-canopied spruce forests, riparian areas, and high elevation areas (Fecske 2002). Fecske et al. (2003) estimate the number of marten within high quality habitat to be 124 resident animals. Additional animals likely occur at lower density outside of high-quality habitat.

In FY2003, four track plate boxes were set up in the southern and central portions of the Forest. In addition, camera bait stations were established at various locations in a planned timber sale area. Two of the track boxes and all of the camera stations were outside of the known main distribution areas. Marten were not detected at any of the 2003 sampling sites. However, one marten was incidentally sighted in the Black Elk Wilderness Area along a trail to Harney Peak, verifying continued presence in the east-central Hills.

The HABCAP model was used to compare Forestwide marten habitat capability values from 1997 with data from 2002. The yearlong capability value remained stable at one percent.

Evaluation:

The current marten population is approximately equal to the number of animals released here during the 1980s and 1990s. Although considerable mortality and reproduction have likely occurred during the ensuing time period, it appears the marten population trend is relatively stable in the Black Hills. The habitat trend is also stable, indicating the Forest is meeting Objective 221.

(MIS)

Monitoring:

Townsend's Big-eared Bat and Fringe-tailed Myotis



Two MIS bat species occur on the Black Hills National Forest: Townsend's big-eared bat (pictured) and the fringed (or fringe-tailed) myotis. The Forest monitors these bats at winter roost sites (hibernacula). Loss of or disturbance in hibernacula is identified as a risk factor for both species (Schmidt 2002a, b). Both bats hibernate in caves and abandoned mines, and structures used for hibernacula are also often used for summer roosts. Monitoring hibernacula allows the Forest to monitor populations, winter habitats, and to a more limited degree, summer habitats.

In FY2003, five hibernacula were monitored across the Forest. One structure was a cave, and four were abandoned mines. Townsend's bats were observed at four sites, and fringed bats were seen at one. Noteworthy results for each roost are as follows:

Cave 1, gated in 1995, occurs within the Jasper Burn. This is the second largest known Townsend's hibernaculum in the Black Hills and is the largest hibernaculum on the Forest. Only Jewel Cave shelters more hibernating individuals. The cave contained 260 Townsend's big-eared bats, which is 20 percent more than it had upon discovery in monitoring year 1994 (Tigner and Aney 1994) and 15 percent less than it housed before the observed decline in 2001 (see table below). This could indicate near-recovery from the event or condition that caused the decline. Although the cause of the decline is not known for certain, it could have been the Jasper Fire in 2000. The fire occurred during summer before bats arrived for hibernation, but it resulted in a loss of vegetation. Vegetation around the

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entrance of caves may regulate temperature and air fluctuations within the cave (Black Hills National Forest 2000). Early seral plants (e.g., grasses) were well established around the mouth of the cave in 2003, indicating understory recovery from the fire. The gate at the cave entrance had not been breached or vandalized since its installation in 1995.

Number of Bats Observed in Cave 1 Monitoring Years 2000 to 2003				
Species	2000	2001	2002	2003
Townsend's Big-eared Bat	300	218	235	260

Mine 1 contained at least 170 Townsend's bats, which is substantially more than it housed during a 1990s survey (Tigner 2003). This mine is now the third most populous roost known on the Forest. The bats were roosting in an area of the mine that had shifted open since the previous survey (i.e., underground materials had moved and re-opened an adit). This is unusual because most instances of collapse result in a loss (closing) of habitat. It is unknown if the new habitat availability caused the bat's increased use. This mine was gated in 2003.

Mine 2 revealed two Townsend's bats one of which was banded (Tigner 2003). Although the band could not be read, location of it (left forearm) indicated the bat was male. The most recent banding of this species in the Black Hills occurred in 1993, indicating this individual was at least 10 years old or dispersed from another location. This species has been known to live at least 21 years (Perkins *in* Tigner and Stukel 2003). Mine 2 was gated in 2003.

Mine 3 represents a newly discovered hibernaculum for Townsend's bat. The mine (and a resident maternal colony of Townsend's bat) was initially discovered during the spring of 2002. This is the first abandoned mine used as a maternity roost in the Black Hills and is one of only a few known maternity mines for the species. This very important mine was gated in 2003.

Mine 4 sheltered four fringed bats. It also housed a species never previously recorded in South Dakota: the eastern pipistrelle (*Pipistrellus subflavus*; Tigner 2003). This species is typically eastern in distribution, although other individuals have been observed further west in Wyoming and Colorado. Mine 4 was stabilized and gated in 2003.

Protective gates were installed at six abandoned mines and two caves in 2003. A culvert was inserted in the main portal of one of the mines to stabilize it. Without stabilization, the mine was likely to collapse and cease providing roost habitat. An additional (previously installed) gate that had been breeched was fortified.

Townsend's bat has been recorded at all eight of the newly gated sites and was the main impetus for installing the gates. Other bats, including the fringed myotis, will also benefit. Prior to gating, one of the newly gated caves showed a decrease in bats' winter use over the past decade. The decline was likely attributable to recreational use of the cave. Shortly after installation, people seeking entry into the cave breached the cave's gate demonstrating the continued popularity of the site. The gate will be fortified in 2004. This and all other gated roosts should be monitored for functionality and use by bats.

Evaluation:



Two hibernacula showed increased use by Townsend's bats in 2003, including one that might have been negatively affected by the 2000 Jasper Burn. One hibernaculum showed a decrease in use but was gated to stabilize the population and promote recovery. One Townsend's bat hibernaculum was newly discovered in 2003. Based on this monitoring data, the forestwide population trend for Townsend's big-eared bats appears relatively stable or slightly increasing.

The data presented above reveal only one observation of fringed myotis during cave and mine monitoring

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sessions. Fringed myotis hibernate most often in cracks and crevices. Furthermore, they usually hibernate individually rather than in groups (Tigner and Stukel 2003). This combination makes them difficult to locate and identify at hibernacula; consequently, few observations occur despite monitoring efforts. Summer monitoring would not resolve the problem. Males exhibit similar elusive behavior during summer. Mother-young pairs often roost communally in cracks and crevices, but they change roost sites often so are still difficult to monitor effectively. Mist-net surveys can be used to detect presence during summer (two fringed bats were observed this way in 2003), but the method is of limited value in determining trends (Schmidt 2002b). Although the forest has sampled for this species and obtained quantitative data through the monitoring program, we are unable to make conclusions regarding trends for fringed myotis at this time.

The Forest installed or repaired gates at seven roost sites to protect Townsend's and fringed bats from human disturbance. Caves and mines are not renewable resources so habitat improvement is dependant on protecting known sites. The substantial protection provided in 2003 reflects an upward trend in known bat habitat and demonstrates active management to successfully accomplish the intent of Objective 221.

NON-GAME BIRDS

In 2001, the Forest began funding the Rocky Mountain Bird Observatory (RMBO) to monitor long-term trends of bird populations through point-count transect surveys. The monitoring program is titled *Monitoring Birds of the Black Hills* (MBBH). Results are reported to the Forest annually (Panjabi 2001, 2003, 2004). Ten habitats throughout the Forest are being monitored: white spruce, northern hills ponderosa pine, southern hills ponderosa pine, late-successional ponderosa pine, aspen, pine-juniper shrubland, mixed-grass prairie, montane riparian, foothill riparian, and burn area (mainly the Jasper Burn of 2000). Not all habitats will be monitored in all years, and adjustments in habitat classifications and transect locations have been and may continue to be necessary as we refine the monitoring program. The monitoring is designed to provide rigorous population trend data on most regularly occurring diurnal (day active) breeding species in the Black Hills using a statistically sound sampling design. Trends in abundance may be less clear for rare species or those with highly variable occurrences; however, the monitoring program will provide insight into other population characteristics such as distribution and habitat associations.

In 2003, RMBO sampled 2,158 point-count stations along 152 transects in 5 habitats. The habitats were as follows: burn area, montane riparian, northern hills ponderosa pine, southern hills ponderosa pine, and white spruce. A total of 105 potential breeding bird species were detected. Because this is only the third year of a long-term monitoring effort, continued monitoring is needed to detect long-term trends. However, the Forest is obtaining valuable preliminary data on species densities and habitat associations that are crucial to long-term trend detection and evaluation of management effects.

Previous Forest Plan monitoring reports relied on USGS Breeding Bird Survey (BBS) data to obtain population information for birds in the Black Hills. Due to the greater rigor and sound sampling design of the MBBH data, BBS data will no longer be reported except for rare species with very infrequent observations. Unless otherwise stated, the RMBO dataset is the primary data source for all birds discussed in this report.

Monitoring:

Pygmy Nuthatch



Historical and current accounts list the pygmy nuthatch as a rare bird in the Black Hills (Pettingill and Whitney 1965, Tallman 2002, Panjabi 2003). The species has been observed only five times during MBBH surveys since 2001; three were in 2001, two were in 2002, and none were in 2003. The observations occurred in northern hills ponderosa pine, late-successional pine, pine-juniper shrubland, and white spruce habitats. This is a more diverse habitat array than is typically used by the species; most literature suggests that the nuthatch is often limited to mature or late-successional-pine habitats (Ghalambor 2001).

The Black Hills BBS data revealed only one record of the species between 1992 and 2002, despite nearly

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70,000 total bird observations. The BBS detection occurred in the southern Black Hills during 1997. According to Panjabi (2003), the nuthatch's scarcity and unpredictable distribution in the Black Hills will preclude accurate density estimates and trend detections by the MBBH program.

District biologists incidentally observed the pygmy nuthatch on two occasions during early spring of 2003. Both sightings were in or near the town of Custer.

The HABCAP model was used to compare Forestwide pygmy nuthatch habitat capability values from 1997 and 2002. Summer capability value decreased slightly from 49 to 47 percent and winter value remained steady at 49 percent.

Evaluation:

Although the Forest has developed a strong bird-monitoring program yielding quantitative data on trends for many birds, point transect data from MBBH for pygmy nuthatch is insufficient to discern population trends at this time. More pygmy nuthatches have been detected in three recent years of MBBH efforts than during a decade of BBS routes, but this pattern reflects a more intense monitoring effort rather than a true population change. The absence of observations during several years of surveys can be expected of a rare species and should not be interpreted as a decline or local extirpation without long-term absence data. Similarly, a modest, short-term increase in detections for such a rarely sighted species would not be strong evidence for a population increase.

Thompson et al. (1998, Chapter 2.4) concluded that monitoring rare populations is very costly and likely will not provide unbiased or precise abundance estimates. The pygmy nuthatch is rare in the Black Hills, and neither the MBBH point transects nor the BBS routes will yield reliable trend estimates. Indications are that it is very difficult to monitor pygmy nuthatch population trends due to its scarcity and unpredictable distribution.

Monitoring:

Brown Creeper



Three years of MBBH data suggests the brown creeper is well distributed in low abundance throughout the Black Hills (Panjabi 2001, 2003, 2004). Direct comparison of all habitat types and all years is not possible due to initiation of a rotational sampling scheme in 2003 (i.e., one-half of all habitats will be sampled in any given year). However, a few patterns can be seen. Total brown creeper observations increased between 2001 and 2002 and only slightly decreased in 2003 when late-successional habitat was not monitored. Creepers were most commonly observed in late-successional and white spruce habitats followed by other pine habitats. Further analysis of MBBH habitat association data shows that at least 90 percent of all creeper observations in each of the past three years have occurred in mature or late-successional habitats (structural stages 4 and 5; Panjabi 2001, 2003, 2004).

The estimated relative density of brown creepers (Panjabi 2001, 2003, 2004) are shown in the table following. In 2002, the relative density decreased in late-successional ponderosa-pine habitat, but increased in white spruce habitat. It is unknown what role the recent drought or yearly weather patterns played in causing this shift. In 2003, the relative density decreased in white spruce habitat, northern hills ponderosa pine and southern hills ponderosa pine. Late-successional ponderosa pine was not monitored in 2003.

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Habitat	Relative Density Estimates of Brown Creeper By Year (birds/km ²)		
	2001	2002	2003
Late-successional Ponderosa Pine	20.4	10.9	Not Monitored
White Spruce	8.6	14.9	7.3
Northern Hills Ponderosa Pine	Insufficient Data	6.3	3.1
Southern Hills Ponderosa Pine	Insufficient Data	4.4	4.2

Source: Panjabi (2001, 2003, 2004).

Evaluation:

Brown creeper observations varied by year, but all years were within 10 percent of the average number of total annual observations (134). Total observations were lowest in 2001, highest in 2002, and intermediate in 2003. Sampling during 2003 did not include the creeper's preferred habitat (late-successional), which almost certainly accounts for the apparent reduction between 2002 and 2003. Based on the number of observations, populations appear relatively stable over the last three years. However, relative density estimates show more variation between years. Since this is only the third year of a long-term monitoring program, continued monitoring is needed to determine if the decrease in relative density in 2003 is indicative of a long-term population trend or is the result of normal annual fluctuations.

The one percent decline in brown creeper habitat capability suggests brown creeper habitat is relatively stable or slightly decreasing.

Monitoring:

Black-backed Woodpecker



Black-backed woodpeckers were detected in three habitat types during 2003 MBBH efforts: burn area, southern hills ponderosa pine, and northern hills ponderosa pine. Results from all three years of the MBBH program are compared in the table below. In 2003, the species was common enough only in burn areas to provide a reliable density estimate (3.6 birds/km²). This density is a non-significant ($p > 0.05$) decrease from 2002's high of 6.9 birds/km² in the same habitat. However, considerably more black-backs were observed during 2003 than in 2001, which was the first breeding year after the burn occurred.

Habitat	Relative Density Estimates of Black-backed Woodpeckers By Year (birds/km ²)		
	2001	2002	2003
Burn Area	Insufficient Data	6.9	3.6
Late-successional Ponderosa Pine	Insufficient Data	1.3	Not Monitored

Source: Panjabi (2001, 2003, 2004).

A study by the South Dakota School of Mines and Technology (Vierling 2004) in the same burn (Jasper Burn) during the same time period (2001 to 2003) shows parallel results of the MBBH program: a large increase in black-backed woodpecker nests from post-burn year one to year two (0 and 11 nests, respectively), followed by a moderate decrease in year three (4 nests).

The HABCAP model was used to compare forestwide black-backed woodpecker habitat capability values between 1997 and 2002. The yearlong black-backed habitat capability value remained stable at 50 percent. The model does not value burns or areas with high beetle densities and therefore does not fully account for habitat capability. The Forest estimates that over 188,000 acres burned between 1998 and 2003, which is more than other five-year averages in recent history. This includes 24,500 acres burned in the 2002 Grizzly Gulch and Battle Creek Fires and 18,000 acres in the 2003 Red Point Fire. Nearly 200,000 acres were infested

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with mountain pine beetles or pine engravers by 2003 (see Monitoring Item 20b). More trees are being killed today than at any other time since the 1970s. This is notable because Rumble (2002) observed much higher (47X) black-backed woodpecker densities within areas severely infested with mountain pine beetles than in areas with low beetle occurrence. Although not all of the area affected by fire or insects has created suitable black-backed woodpecker habitat, a large portion in ponderosa pine probably has.

Evaluation:

The MBBH program highlights the importance of early-successional burns and late-successional forests to the black-backed woodpecker. Rumble (2002) confirms that beetle-killed areas are also important. Habitats created by fire and insects are temporary and episodic. Black-backed woodpeckers have evolved with these conditions, and are known to have population irruptions (growths) that coincide with the events (Anderson 2002). The amount of time that black-backs fully exploit these habitats is variable, but population declines are expected relatively quickly after initial irruptions. The decline in the black-backed woodpecker population only three years after the 2000 Jasper Burn is consistent with observations in other parts of the bird's range (Anderson 2002). The above-average addition of recently burned acres and beetle-killed trees is likely creating more suitable habitat. Localized irruptions are expected to occur in these areas over at least the next few years, but the areas will not be specifically sampled through the current MBBH program. Jasper Burn colonization patterns suggest that black-backs probably began using the Grizzly Gulch and Battle Creek Burns during 2003, and will likely colonize the Red Point Burn in 2004.

Due to the amount of new habitat created and the number of birds observed, both the population trend and habitat trend appear to have been increasing for the black-backed woodpecker over the past several years.

Monitoring:

American Three-toed Woodpecker



Three-toed woodpecker (*Picoides dorsalis*) observations have steadily increased since the MBBH program began in 2001. In 2003, all but one observation occurred in white spruce habitat. The exception was not so distinct, as it occurred along a northern hills ponderosa pine transect that had inclusions of spruce. Strong relationships between three-toed woodpeckers and spruce were also seen in 2001 and 2002, indicating the species preference for this habitat type in the Black Hills. The relative density estimate (Panjabi 2001, 2003, 2004) has also increased since 2001 (see table below).

Habitat	Relative Density Estimate of American Three-toed Woodpecker By Year (birds/km ²)		
	2001	2002	2003
White Spruce	Insufficient Data	1.8	3.64

Source: Panjabi (2001, 2003, 2004).

The HABCAP model was used to compare Forestwide three-toed woodpecker habitat capability values from 1997 with data from 2002. The yearlong habitat value decreased slightly from 33 to 32 percent. The model does not assign a value to burns or insect outbreaks in spruce habitat, but literature suggests these areas may support higher densities of three-toed woodpeckers (Anderson 2002). Portions of the 2002 Grizzly Gulch Fire burned through spruce habitat, and may have created optimal habitat for the three-toed woodpecker. The Grizzly Gulch Burn is not specifically sampled through the MBBH program so any possible population increase remains undetected. To date the species has not been found in the 2002 Jasper Burn, which occurred in a pine-dominated landscape.

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Evaluation:

Observations over the past three years indicate the three-toed woodpecker population trend is increasing. HABCAP modeling suggests habitat is relatively stable or slightly decreasing, but recent fires in spruce habitat may have counteracted any small decrease. Overall, habitat trend for the American three-toed woodpecker appears stable. The Forest is meeting Objective 221 for the species.

Monitoring:

Osprey



Ospreys are associated with large fish-bearing impoundments and are monitored more effectively through specific nest observations than through the MBBH program. Ospreys were not known to nest in the Black Hills prior to 1990 (Tallman et al. 2002). Since then, five nests have been discovered, including one in 2002. All three osprey nests monitored in 2003 were active, and evidence of fledging was observed at two of the three nests. One osprey was observed away from all known nests (near Deerfield Lake) during 2003 BBS surveys; this area should be monitored in the future to detect nesting attempts.

There is no HABCAP model to evaluate osprey habitat capability. However, the critical component of osprey habitat is fish-bearing waters, and there has been no change in this for many years. No major impoundments have been created or destroyed, and there have been no substantial changes in the State's fish stocking program that would affect the osprey.

Evaluation:

The increasing population trend and stable habitat trend indicate the Forest is meeting Objective 221.

Monitoring:

Northern Goshawk



Black Hills National Forest (BHNF) district biologists monitor goshawks by measuring long-term occupancy of known territories and associated nest sites. In addition to providing trend data, it identifies specific habitat features (e.g., nests) that can then be protected. Although the RMBO protocol is not the primary method used to monitor goshawks, it contributes to our primary program by identifying goshawks outside of known territories that district biologists can then search for nests.

The SDGFP supplemented our 2003 goshawk-monitoring program through a contract. The contracted biologists employed a protocol very similar to the one district biologists used. The district biologists and the contractors also conducted inventories to identify new goshawk territories. The data presented in the table below are a combination of the contracted and the district efforts, but each territory was included only once. It also displays the number of new territories discovered during inventory efforts.

Ranger District	Territories Monitored	Territories Confirmed Occupied	Percent Territories Occupied	New Territories Discovered
Bearlodge	23	5	22%	1
Northern Hills	19	7	37%	0
Mystic	13	7	54%	0
Hell Canyon	18	6	33%	1
Total	73	25	34%	2

There were a few noteworthy observations from 2003 goshawk-monitoring efforts:

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- A second territory and its only known nest was discovered to have been affected by the Battle Creek Fire of 2002 (the first territory was reported in 2002). Although the nest was known to exist before the fire, it was not monitored for fire effects until 2003. High intensity fire burned very close to the nest tree, and even though the nest did not burn, the habitat surrounding it was substantially altered. No goshawks were detected within the territory this year. Further monitoring will be necessary to determine how goshawk use of the territory will be affected.
- Including the Battle Creek nest described above, there are 11 known nests that have been affected by fire since 1998, which is approximately 8 percent of all nests known to the Forest. Most were lost in the Jasper Fire of 2000. In some cases, suitable unburned habitat and known alternate nests exist nearby and could be adopted for nesting with relatively minor changes in territory use. In at least one case, consumption was extensive and is assumed to have caused territory displacement or abandonment.
- The Red Point Fire or any other 2003 fire affected no known goshawk territories.
- The goshawk territory that had nest vandalism reported in 2001 and 2002 showed no evidence of vandalism in 2003.
- The territory occupancy rate was higher in 2003 than in any other year since 1999 (see table below). Territories with known burned nests were not included in the occupancy rates.

Northern Goshawk	YEAR				
	1999	2000	2001	2002	2003
Number of Territories Monitored	12	42	46	84	73
Percent of Territories Occupied	58%	29%	20%	24%	34%

Several habitat alterations have occurred over the past five years. The Forest estimates over 188,000 acres burned between 1998 and 2002, and nearly 200,000 acres were infested with mountain pine beetles or pine engravers by 2003 (Black Hills National Forest 2004). Storms have altered an unquantified amount of habitat. Monitoring has shown a direct negative effect of these events on nesting habitat, but there could be positive effects to foraging habitat. Some prey species such as the Black-backed woodpecker are likely increasing due to recent fires and insect activity.

Habitat alteration from management practices such as timber harvests were observed within or near several nest stands over the past several years. In some cases, nesting habitat was noted as suitable after harvest. In at least one instance, harvest is thought to have reduced habitat suitability within the nest stand. All of these harvests were designed prior to adoption of the Phase I Forest Plan Amendment.

The HABCAP model was used to compare Forestwide goshawk habitat capability values from 1997 with data from 2002. Summer habitat value increased slightly from 54 to 55 percent, and winter values remained stable at 54 percent. The model may not be sensitive enough to reflect all meaningful changes, as it appears to be unaffected by the large fires, insects, and weather events that occurred over the past few years.

Evaluation:

The goshawk territory occupancy rate was higher in 2003 than in any other year after 1999, but the rate is still lower than what it was in 1999. Occupancy appears to have substantially declined after 1999 but annual differences in sample sizes may explain much of the change. Small sample sizes, such as seen in 1999, are less likely to reflect accurate conditions than large sample sizes (e.g., >25). Also, monitoring may have been limited to suspected active or regularly active nests, causing the occupancy rate to appear higher. The occupancy rates in 2001 through 2003 did not include territories affected by fire, so the reported rates in those years are probably higher than the true rates. Overall, the goshawk population trend appears relatively stable

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or decreasing due to loss of nests to fire.

The HABCAP model indicates goshawk habitat is relatively stable over the five-year reporting period. However, observed natural events and management activities have caused some reduction in nesting habitat. The management activities occurred prior to implementation of the Phase I Amendment. Nesting habitat trend appears to be decreasing due primarily to fire. Monitoring should be continued to determine long-term trends.

Monitoring:

Bald Eagle



The bald eagle winters in and migrates through the Black Hills, but does not breed here. From October through March, eagles are frequently seen perched near lakes or streams, feeding on road-killed deer, or soaring in the sky. The Forest monitors the species by recording sightings during normal work activities (i.e., incidental observations).

The table below shows the number of bald eagles observed on each district over the past five years. Observations have been variable with 2003 representing an all-time high.

District	Number of Annual Bald Eagle Sightings				
	FY1999	FY2000	FY2001	FY2002	FY2003
Bearlodge	15	0	0	15	15
Hell Canyon	12	14	5	9	5
Mystic	51	24	22	51	>55
Northern Hills	4	9	0	0	23
Total Forest	82	47	27	75	>98

A more standardized mid-winter eagle count is coordinated annually across 42 states by the U.S. Geological Survey (USGS). An analysis of data for the prairie eco-region (which includes the Black Hills) shows a 3.2 percent annual increase of wintering bald eagles between 1986 and 2000 (Steenhof et al. 2002). Although it was a non-significant change ($p < .001$), it was greater than the significant two percent increase attributed to the entire contiguous United States. Nesting rates for the Prairie Ecoregion are not available, but nesting populations in the lower 48 states have increased nearly 8 percent per year over the same 12-year time period as the mid-winter increase (USGS 2003). Eagles were not known to nest in South Dakota until 1994, but to date 35 nests have been discovered (SDGFP 2004). Most of them occur along the Missouri River or further east, but one occurred along the Belle Fourche River within 30 miles of the Black Hills. The Belle Fourche nest has not been active in recent years.

The HABCAP model was used to compare Forestwide bald eagle habitat capability values from 1997 with 2002 data. Winter capability value increased slightly from eight to nine percent. Foraging areas such as fish-bearing waters and highways have not changed. Transitional roosts (large trees and snags) remain abundant on the Forest and are not considered limited. No traditional roost sites (i.e., with repeated and concentrated use) are known to occur in the Black Hills.

Evaluation:

The variation in bald eagle sightings over the past five years, including the high in 2003, is probably more related to the non-standardized methodology than to actual population changes. The prairie eco-regional data is likely a more accurate indicator of what is occurring with wintering eagles in the Black Hills. Regardless, both data sets indicate an increasing population trend. Increased nesting activity in South Dakota opens the possibility for nesting in the Black Hills, but to date no summer sightings have occurred.

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All three habitat indicators (HABCAP, foraging habitat, and roost availability) suggest bald eagle habitat is stable in the Black Hills. Therefore, it appears the Forest is meeting Objective 221.

INVERTEBRATES

Monitoring:

Cooper's Rocky Mountain Snail and Cockerell's Striate Disc



In 2002, the Forest received the final report from a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). Many of the sites had been surveyed in the early to mid 1990s, and some were re-visited in 1999 to help assess population changes. More than 100 new sites were inventoried for the first time. A total of 38 species were identified including 12 that were previously undocumented in South Dakota. The surveys also provided information on two species with both R-2 sensitive and MIS status: the Cooper's rocky mountain snail (*Oreohelix strigosa cooperi*) and Cockerell's striate disc (*Discus shimeki*). Cockerell's disc was found at a total of 18 sites. Cooper's snail was found at 102 sites, including 61 sites that contain a morph of *Oreohelix* that Frest and Johannes (2002) propose be split from the Cooper's snail into its own species. Frest refers to this morph as *O. n. spl*. However, because this proposal has not been accepted through a peer review process and preliminary taxonomic research does not support splitting the species (report from T. Anderson, 12/2002), the Black Hills National Forest currently recognizes only the one species.

When comparing original survey data with data replicated in 1999, several noteworthy changes are revealed: (1) five sites appear to have lost the Cooper's snail; (2) one site gained Cooper's snail; (3) one site lost Cockerell's disc; and (4) one site gained Cockerell's disc. In addition, sites surveyed for the first time in 1999 show Cockerell's disc at 7 sites and Cooper's snail at 42 sites.

Seven of the Frest sites surveyed in either 1991 (Frest 1991), 1992 (Frest 1993), or 1999 (Frest and Johannes 2002) were monitored by district biologists in 2003. Results are as follows:

- Site 11: Cooper's snail present (live) in 1991, 1999, and 2003, indicating a stable site for this species. Cockerell's disc present in 1991 and 1999, but due to observer inexperience it is unknown if the species was present in 2003.
- Site 10: Original surveys in 1991 revealed only dead Cooper's snails, but the subsequent visit in 2003 showed live individuals were present. This site was not monitored during interim surveys in 1992 and 1999. Cockerell's striate disc was not observed during any survey.
- Site 86: Cooper's snail was observed alive at this site in 1992 and 1999, but 1999 surveys indicated the species was confined to tiny areas. The original survey site was not monitored in 2003, but suitable habitat nearby (1/4 mile) was. The new survey area was approximately halfway up the canyon wall just below a limestone cliff, whereas site 86 is along the roadbed near the bottom of the canyon. Cooper's snail was abundant at the perched site; more than 100 live individuals were noted. It is likely both live and dead individuals have slid, rolled, or otherwise traveled down slope, allowing live individuals to disperse and dead shells to concentrate. Because of this connection, the new site should be treated as an extension of site 86 during project planning efforts. Cockerell's striate disc was not observed during any survey.
- Site 261: Original surveys in 1999 found very rare live specimens of the morph Frest proposed splitting from the Cooper's snail. 2003 surveys did not reveal any live snails, indicating either the species was absent or live individuals were too rare to be detected by the Forest's relatively inexperienced observers. This site warrants further monitoring to clarify accurate site trend. Cockerell's striate disc was not observed during any survey.

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- Site 262: Original surveys during 1999 noted uncommon live specimens and numerous dead shells of the morph Frest proposed splitting from the Cooper's snail. Shells were observed in 2003, but live snails were not. This indicates either the species was absent, or live individuals were too rare to be detected by the Forest's relatively inexperienced observers. This site warrants further monitoring to clarify accurate site trend. Cockerell's striate disc was not observed during any survey.
- Site 263: Original surveys during 1999 noted rare long-dead specimens of the morph Frest proposed splitting from the Cooper's snail. Shells were detected in 2003 but live snails were not, indicating a prolonged absence of the species from this site. Cockerell's striate disc was not observed during any survey.
- Site 279: Original surveys during 1999 noted very rare live specimens of the morph Frest proposed splitting from the Cooper's snail. More than 20 live specimens of this morph were detected in 2003, indicating the species is still present at this site. Cockerell's striate disc was not observed during any survey. Heavy elk and livestock utilization was noted in the meadow adjacent to (but not within) this site, indicating the snail site may need additional protection measures if utilization continues to be high.
- Site 280: Neither Cooper's snail nor Cockerell's striate disc have been observed here during surveys in 1999 or 2003. However, a new survey was completed near a large rock outcrop less than 0.1 mile upslope from this site. The survey revealed live *Oreohelix* specimens of the morph Frest proposed splitting from Cooper's snail. Because of the close proximity and connection, the new site should be treated as an extension of site 280 during project planning efforts.

Live Cooper's snails were found at six previously unsurveyed sites. The sites probably do not represent snail expansion areas but instead contribute to the Forest's inventory of known occupied sites. Some details are as follows:

- Live Cooper's snails were detected at four new sites within or near Spearfish Canyon. Two of the sites occur within the boundary of the Spearfish Canyon fuels reduction project, and mitigation measures have been applied to protect the snails. All four sites are somewhat expected because Spearfish Canyon contains a great deal of unsurveyed suitable habitat, and Cooper's snails are known to occur throughout the area.
- Live Cooper's snails were detected within two new areas on the Mystic Ranger District (RD); both belonged to the morph Frest proposed splitting from the Cooper's snail.
- Snail surveys were conducted on the Coulsen and North project areas (Hell Canyon RD), but no sensitive snails were found.

There are no HABCAP models to evaluate snail habitat capability or determine habitat trend. No known occupied sites for either species were lost in the 2003 Red Point Fire.

Evaluation:

One site previously thought to contain only dead Cooper's snails is now known to support live specimens. Two sites where Cooper's snails were rare in the past may now be void of snails. One site previously without Cooper's snails had a new population discovered within a short distance. Four previously unknown sites were discovered to house Cooper's snail. Overall, this indicates a stable population trend for Cooper's snail. Limited data collected since the early 1990s suggest Cockerell's disc populations appear stable overall.

No habitat losses were noted during 2003 for either Cooper's snail or Cockerell's disc; therefore, habitat trend for both snail species appears stable. It appears the Forest is meeting Objective 221.

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Monitoring: Regal Fritillary



The regal fritillary is found in remnant prairie sites throughout South Dakota. According to Royer and Marrone (1992), there are only two historic records of the butterfly in the Black Hills area, and both were off-Forest at the edge of the Black Hills. One was in Custer State Park during 1946, and the other was in the Fort Meade Recreation Area during 1985. Neither the South Dakota Natural Heritage Database nor Forest records reveal regal fritillary sightings on Black Hills National Forest. In 2003, a district biologist reported a potential regal fritillary sighting in the Elk Mountains, but the specimen was not collected or verified. The butterfly was not in prairie habitat. The area will be surveyed in 2004 to validate the report.

There is no HABCAP model to evaluate butterfly habitat capability. Because regal fritillaries have not been found on the Forest, it is not possible to precisely describe or quantify their habitat here. In the absence of known use sites, it is reasonable to assume any grassland may provide habitat, particularly where >250 acres of contiguous grasslands are present. Between 1998 and 2002, grassland acres on the Forest increased from 104,341 acres to 109,470 acres or by 7.5 percent (Black Hills National Forest 2004). This includes all grassland acres regardless of size or native species abundance.

Evaluation:

The regal fritillary has not been confirmed on the Forest. Management effects and population trend cannot be measured if the species is not present or locatable. It is possible individual regal fritillary occasionally occur in limited areas, but at best the species is rare. Thompson et al. (1998, Chapter 2.4) concluded monitoring rare populations is very costly and likely will not provide unbiased or precise abundance estimates.

AQUATIC MIS

The Phase I Amendment designated brook trout, brown trout, finescale dace, lake chub, and mountain sucker as Management Indicator Species (MIS). Brook trout and brown trout are important game species not native to the Black Hills. Lake chub, finescale dace, and mountain sucker are native to the Black Hills area.

Forestwide population trend monitoring for fish MIS is outlined in the BBNF Monitoring Implementation Guide (USDA Forest Service 2003). Fisheries data collected by the South Dakota Department of Game, Fish and Parks and the Wyoming Game and Fish Department give an indication of population trend in the Black Hills.

Monitoring: Brook Trout, Brown Trout and Mountain Sucker

Population Trend.

Brook trout and brown trout were stocked or transplanted on the Black Hills prior to the 1900s. These species are well distributed forestwide, and most suitable habitat is currently occupied by one or both of these species. Brook and brown trout populations are managed to provide recreational fisheries sustained largely by natural recruitment. Harvest regulations and the supplemental stocking of streams, primarily with brown trout, in combination with habitat management maintain populations at desirable levels.

Historic surveys indicate the mountain sucker was widely distributed across the Black Hills (Evermann and Cox 1896, Bailey and Allum 1962, Stewart and Thilenius 1964). Recent surveys suggest mountain sucker occur in many of its historic drainages throughout the Black Hills (Isaak et al. 2003), but localized population reductions or absence at selected sites may have occurred.

Population estimates at Forestwide survey sites for brook trout, brown trout, and mountain sucker are shown in Tables A and B. Not all species are expected to be collected at every site. Target species for that site are highlighted. Population estimates in Table A are reported in the number of fish per mile. Population estimates in Table B are the number of fish estimated in a sampled stream section, usually 100 meters.

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Table A. Historic populations (number of fish/mile) of brook trout, brown trout and mountain sucker (Stewart and Thilenius 1964).					
Stream	Reach/Site	Date	Number of fish/mile by species		
			BKT	BNT	MTS
Battle Creek	Grizzly Gulch confluence to 0.5 mile above Hayward	6/60	-	10	140
Bear Butte Creek	0.5 mile below Chicken Inn to Strawberry Creek confluence	7/60	70	-	20
Boxelder Creek	Steamboat Rock Picnic Ground to Norris Peak Road	7/62	10	10	-
Elk Creek	Hall Ranch to Highway 385	7/61	-	-	300
French Creek	Stockade Lake to Hwy 87	7/60	20	-	130
Iron Creek	Headwaters to 0.5 mile below Camp Remington	8/62	80	-	140
	Camp Remington to 0.25 mile below Highway 16A	7/60	230	-	10
Little Spearfish Creek	Headwaters to Forest Service Work Center	7/60	1,100	320	-
Rapid Creek	Castle Creek confluence to 1 mile below Silver City	8/62	-	540	-
Rhoades Fork	Beaver Ponds to South Fork Rapid Creek confluence	7/62	1,480	1,330	-
South Fork Rapid Creek	Melcher Sawmill to North Fork Rapid Creek confluence	7/59	-	260	220
Spring Creek	1 mile east of Hill City to Mitchell Lake	9/59	-	-	3,890

BKT = brook trout; BNT = brown trout; MTS = mountain sucker

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Table B. Population estimates for brook trout, brown trout and mountain sucker at designated survey sites (1980s – present).						
Sampling Site	Date	Species				
		BKT		BNT		MTS
		< 8"	≥ 8"	< 8"	≥ 8"	
Battle Creek Site 4	7/84	41	4	-	-	-
	6/94	104	15	-	-	-
Bear Butte Creek Site 14	9/84	-	-	-	-	7
	9/97	-	1	-	-	87
	11/97	5	2	-	-	257
	9/99	64	11	-	-	3
	9/00	100	27	-	-	168
Bear Butte Creek Site 15 (Site 6.5 data pre-1990) (Site 3 data pre-2000)	9/84	-	-	-	-	14
	9/92	14	-	-	-	134
	7/97	18	1	-	-	80
	11/97	9	6	-	-	12
	9/99	104	3	-	-	-
	9/00	91	50	-	-	123
Boxelder Creek site 1 (1984 Site 9)	7/84	58	7	199	76	22
	7/93	41	2	22	8	19
Boxelder Creek site 2	7/93	25	4	21	27	5
Corral Creek Site 1 (1985 Site 3)	6/85	35	3	-	-	-
	7/94	100	56	-	-	-
East Spearfish Creek Site 1	10/92	1	-	222	95	-
	6/98	384	87	384	87	-
East Spearfish Creek Site 2	7/85	1	-	98	20	-
	9/88	-	-	87	93	-
	9/90	-	-	96	39	-
	10/92	8	2	200	31	-
	6/98	-	-	115	30	-
East Spearfish Creek Site 3	10/92	1	-	228	33	-
	6/98	4	-	210	34	-
Elk Creek Site 4	6/85	37	8	-	-	253
	7/97	105	40	8	-	213
Elk Creek Site 5	9/84	13	16	1	18	89
	8/97	96	16	2	2	250
French Creek Site 5	5/92	-	-	1	37	31
Iron Creek South Site 2	7/84	104	-	-	-	-
	7/92	205	-	1	-	-
	7/93	39	-	1	-	-
	7/94	412	-	-	-	-
	8/98	318	3	-	5	-
Iron Creek South Site 4	7/93	100	-	-	-	-
Little Spearfish Creek Site 1	7/85	1	-	9	2	-
	8/94	29	1	26	26	-
Little Spearfish Creek Site 2	6/98	91	2	28	6	-
Rapid Creek Site 1	9/92	-	-	81	26	-
	9/93	-	-	84	14	-
	9/94	-	-	255	25	-
	10/95	-	-	32	18	-
	9/96	-	-	20	8	-
Rapid Creek Site 3	10/91	-	-	92	21	-
	9/92	-	-	74	36	-
	9/93	-	-	179	42	-
	9/99	-	-	114	31	-
	10/00	-	-	51	23	-

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Table B. Population estimates for brook trout, brown trout and mountain sucker at designated survey sites (1980s – present).						
Sampling Site	Date	Species				
		BKT		BNT		MTS
		< 8"	≥ 8"	< 8"	≥ 8"	
Rapid Creek Site 4	9/85	-	-	67	70	-
	8/90	-	-	204	37	-
	10/90	-	-	186	37	-
	10/91	-	-	164	60	-
	9/92	-	-	194	78	-
	9/93	-	-	232	37	-
	9/94	-	-	144	69	-
	10/95	-	1	107	38	-
	9/96	-	-	75	20	-
Rhoads Fork of Rapid Creek	9/85	20	-	234	18	-
	7/94	1	-	133	17	-
Spring Creek Site 3	7/84	-	-	1	6	21
	7/93	22	3	1	15	28
Spring Creek Site 7	7/84	-	-	1	1	-
	9/93	-	-	-	12	25
South Fork Rapid Creek Site 1	8/84	-	-	32	3	-
	7/94	-	-	122	9	-
South Fork Rapid Creek Site 2	8/84	-	-	82	3	-
	7/94	-	-	149	15	-

BKT = brook trout, BNT = brown trout, MTS = mountain sucker

Habitat Trend

Habitat condition is influenced by natural events, such as droughts or floods, and human activities. Reduced stream flows have been attributed to increased timber density and canopy closure (Stewart and Thilenius 1964). Fire suppression and silvicultural practices have contributed to that condition. Other private, local, and federal land-use activities, such as logging, grazing, mining, water diversions/dams and road construction, and maintenance have historically and continue to affect aquatic habitats. The effects of these activities on the BHNF have been reduced compared to past conditions due to increased environmental laws, regulation and policy.

On a more localized level, projects have been implemented to improve the quality or quantity of stream habitat in cooperation with state resource agencies and local partners. These efforts have included projects such as stream enhancement on Castle Creek and Rapid Creek downstream of Deerfield and Pactola reservoirs, respectively, to repair damage flooding caused in the 1970s. Other projects to improve streamside vegetation and bank stability as well as instream diversity have occurred on Iron Creek, Box Elder Creek, and other perennial streams.

Modified streamflows and habitat enhancements downstream of major reservoirs provide the conditions for high quality recreational trout fisheries. Generally more stable flows exist compared to natural conditions. These tailwater conditions exist at Deerfield Dam and Pactola Dam. Releases from Sheridan Dam are contingent upon inflow and maintaining the reservoir level; therefore, maintenance of a brown trout fisheries has been sporadic especially in dry years. These altered conditions combined with the management emphasis on trout and the habitat fragmentation caused by the dam itself may be to the detriment of some native fish species, such as mountain sucker.

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Monitoring:

Lake Chub

Population Trend

The overall population trend of lake chub on the Forest is one of decline when comparing past to present distribution and numbers. Historic accounts suggest the lake chub was widely distributed across the Black Hills (Isaak et al. 2003). Surveys conducted in the early 1890s documented lake chub in Rapid, Spring, French and Beaver creeks (Evermann and Cox 1896). Subsequent surveys summarized by Bailey and Allum (1962), confirmed the presence of lake chub in previous locations into the late 1920s and early 1930s and identified additional occurrences in Grace Coolidge Creek and South Fork Castle Creek. Observations of lake chub in Wyoming have included the Belle Fourche River, Inyan Kara Creek and Blacktail Reservoir off of the Forest. The lake chub population on the Forest is currently restricted to Deerfield Reservoir, which impounds upper Castle Creek.

Trend data collected by SDGFP since 1994 suggest the population in Deerfield Reservoir has declined in recent years, but is certainly greater than when the reservoir was chemically renovated in 1982 to reduce the white sucker population and appears to have stabilized at a lower level (Isaak et al. 2003). The number of lake chub collected and catch per unit effort (CPUE) based on SDGFP gill net sampling since 1994 is shown below.

Gill net sampling	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Number caught	-	-	-	15	155	55	11	6	4	3
CPUE*	114.3	105.5	109.0	3.8	38.8	13.8	2.8	1.5	0.6	0.8

*Catch Per Unit Effort equals the number of fish caught per gillnet set overnight.

Habitat Trend

Past activities that degraded riparian/aquatic ecosystems in combination with the reduction of beaver and the ecological role they play have negatively affected habitat.

The construction of dams and diversion structures since European settlement has fragmented stream habitats and prevented the types of stream movements many stream fishes make in association with spawning, overwintering, or refounding extirpated populations (Isaak et al. 2003). In the case of lake chub, these human-created impoundments are not entirely negative as evidenced by this species persistence only in Deerfield Reservoir.

Habitat condition in Deerfield Reservoir is stable based on trophic state (total weight of plant biomass in a waterbody at a specific location and time). In simple terms, eutrophication is the movement of the lake's trophic state in the direction of more plant biomass. Waterbodies with low trophic state index (TSI) values (<40) are considered oligotrophic (clear, well oxygenated, nutrient poor) while those with higher values (>50) are considered eutrophic. Piroutek (1991) reported the trophic status of Deerfield Reservoir was comparable to conditions in 1980, suggesting habitat conditions for lake chub had not deteriorated. The TSI values (Carlsen 1977) calculated based on secchi disk (SD) transparency, chlorophyll a (Chl a), and total phosphorus (TP) reported by SDGFP (2001) are shown below for a comparison of past to present conditions.

TSI Values	6/79	8/79	6/80	8/95	8/96	8/97	9/99	9/00	2001	2002	2003
SD	36	38	40	36	41	41	39	39	-	-	32
Chl a	-	-	36	36	39	53	47	-	-	-	-
TP	37	37	-	37	37	47	46	37	44	-	37

Source: SDGFP 2001 and SDGFP unpublished data

Water chemistry testing in 2000 indicated a return to oligotrophic conditions after drifting into the

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mesotrophic range based on increased levels of chlorophyll a and total phosphorus that occurred in 1997 and 1999 (SDGFP 2001). These oligotrophic conditions were maintained based on 2003 data.

The deposition of sediments and the natural process of eutrophication will gradually decrease the amount of habitat available for lake chub. Sabtan (1988 cited in Piroutek 1991) estimated a 0.3 percent annual loss in reservoir volume due to sedimentation and predicted a cumulative loss in reservoir volume of 14.8 percent by 2000. The low rate of sedimentation was attributed to the small, vegetated drainage area with underlying rock formations resistant to erosion and the absence of large-scale agricultural activities or extensive development in the drainage.

Monitoring: Finescale Dace

Population Trend

In the South Dakota portion of the finescale dace's range, no populations historically or currently have been documented to exist on BHNH lands (Isaak et al. 2003). In the Wyoming Black Hills, finescale dace distribution is limited to the Redwater Drainage with the exception of Geis Irrigation Reservoir on Middle Fork Hay Creek. The distribution and numbers of finescale dace in Wyoming has been influenced by transplants (WYGF 1996). It is unclear if these transplants, when successful, were an effort to establish the species in unoccupied suitable habitat, to supplement existing populations, or to reestablish extirpated populations.

In June 1978, finescale dace were collected from Medicine Lake and from a beaver pond on the North Fork of Cow Creek and were transplanted to the following creeks in the Bear Lodge area (B. McDowell, WYGF, pers. comm.):

- Tent Canyon Creek (n = 74)
- Richardson Creek (n = 24)
- Cole Canyon Creek (n = 124)
- North Fork Miller Creek (n = 303)
- Ogden Creek (n = 49)
- Lytle Creek (n = 124)

Follow-up sampling in 1979 recaptured finescale dace in Tent Canyon, Richardson, Cole Canyon, and both forks of Lytle Creek.

Finescale dace were first documented in Hemler Reservoir during a chemical treatment in 1976. A large population was found in the reservoir during sampling in 1979 (B. McDowell, WYGF, pers. comm.). Finescale dace were transplanted from Ogden Creek into Hemler Reservoir in 1982 and have been recorded in sampling since that time. Finescale dace were transplanted from Ogden Creek to Sand Creek in 1982, but this transplant was unsuccessful. Geis Irrigation Reservoir, located on Middle Fork Hay Creek and immediately downstream of the BHNH boundary, was stocked in 1983 with finescale dace from Hemler Reservoir.

Surveys in 1990 found finescale dace in very marginal habitat of decadent beaver ponds on Ogden Creek. Based on 1997 observations, populations of finescale dace persist in Richardson, Tent Canyon, Ogden, Rocky Ford, Cow, Redwater, and Spotted Tail creeks and Hemler Reservoir (WYNDD 2002). The relative abundance of finescale dace at these sites is generally rare with the exception of Hemler Reservoir, where this species was classified as common (WYGF 1996). Olson (1998) collected finescale dace with little effort in Hemler Reservoir and estimated the population as sizeable but did not collect this species upstream or downstream of the reservoir.

The WYGF sampled several stream sites on Cow Creek and Redwater Creek in 2003 but only found finescale dace in Hemler Reservoir where the population is thriving (B. McDowell, WYGF, pers. comm.)

Habitat Trend.

Isaak et al. (2003) speculated a general negative trend in stream habitat has occurred due to land use practices

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that probably lowered water tables along streams, combined with a beaver population much reduced from historic abundances that has decreased the amount of boggy, pond-like habitat preferred by this species.

Dams, such as at Hemler or Geis reservoirs, fragment stream habitat but also provide standing water habitats conducive to finescale dace. The amount of habitat in these reservoirs is dependant on environmental conditions, such as drought, as well as human activities. The water storage in Hemler Reservoir is leased. The reservoir is affected by frequent dewatering for irrigation and stockwater use that reduces habitat suitability, but a small pond remains near the lake outlet that prevents total dessication and appears to serve as a refuge for this species (M. Surber, BHNF personal communication cited in Isaak et al. 2003).

Monitoring Item 27: Scenic Integrity

Objectives:

- 401. Review all existing projects and areas that do not meet the adopted Scenic Integrity Objective (SIO) specified for each management area, and set priorities for rehabilitation.**
- 402. Provide natural appearing landscapes with diverse scenery and enhance opportunities to enjoy attractive settings. Maintain the following:**

Scenic Integrity Objectives (Thousands of Acres)	
Very High	11
High	151
Moderate	524
Low	552
Very Low	4

Monitoring normally occurs one year after the completion of all work related to a project. No projects planned under the current Forest Plan completed in the prior year were identified for monitoring. The project listed below was monitored at completion.

Monitoring:

Recreation Facilities Construction

An accessible trail with fishing platforms and a bridge connecting the Horsethief Campground and the Horsethief Day-Use Area was completed in 2003.

Background.

Existing facilities at the day-use area included a restroom, parking area, and a fishing platform. In addition there is a native-surface connecting trail from the day-use area to the Horsethief Campground that utilizes an old highway grade and includes a steel double-lane highway bridge as a trail bridge.

This project was designed to provide additional fishing platforms and a boardwalk to minimize lake shore damage, replace the steel highway bridge with a wooden trail bridge, and harden the connecting trail. All components were designed to be accessible.

Approximately 72 percent (\$192,000) of this project was funded with Intermodal Surface Transportation Efficiency Act (ISTEA) Grant Funds as this site is along the Peter Norbeck National Scenic Byway. The Forest Service funded the balance of this project (\$75,480).

The Scenic Integrity Objective (SIO) for this recreation complex is MODERATE, with a Development Level 3. See Forest Plan Guideline 5210.

“A MODERATE scenic integrity refers to landscapes where the valued landscape character “appears slightly altered”. Noticeable deviations must remain visually subordinate to the landscape character being viewed”. Landscape Aesthetics, Chapter 2, p. 4.

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Trail Bridge:

Before



After



Connecting Trail:

Before

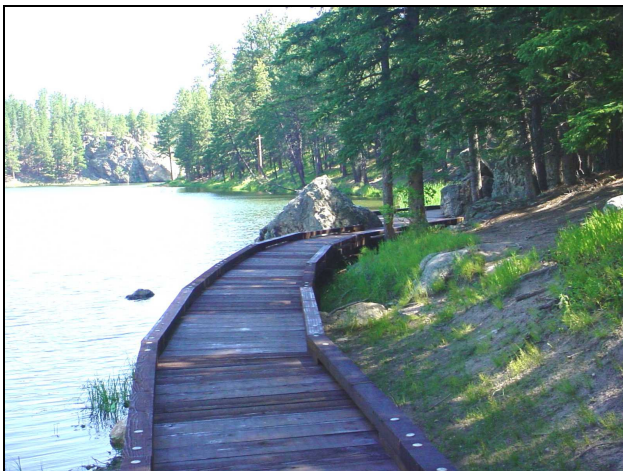


After

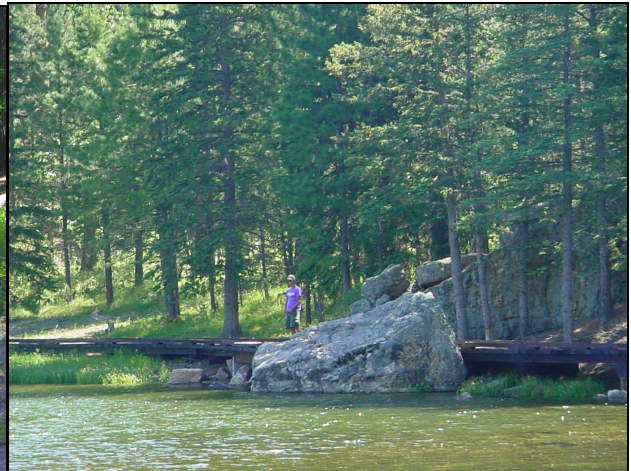


New Construction:

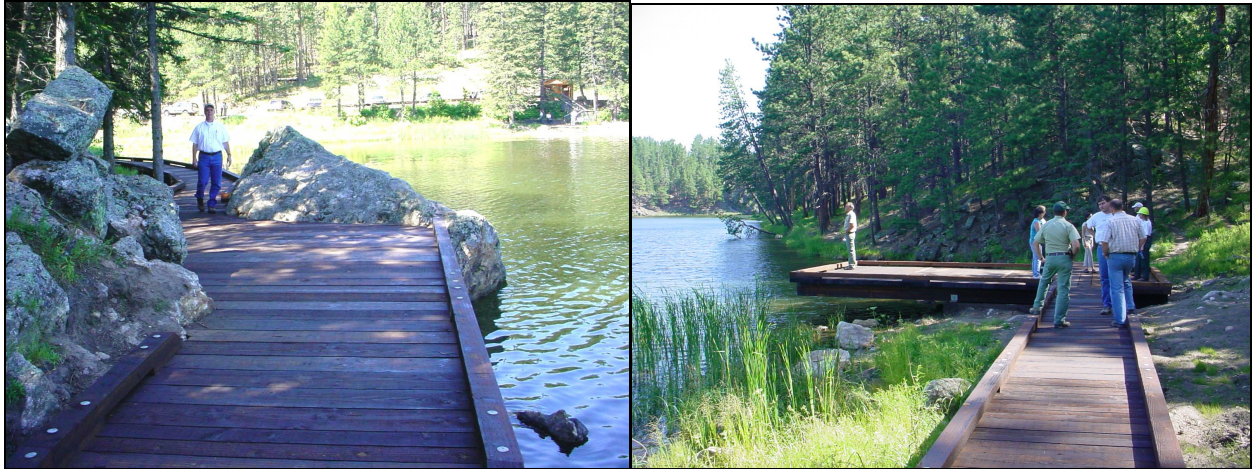
Boardwalk



Fishing Platform



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Conclusion:

The boardwalk, trail bridge, and connecting trail appeared to “fit” the site.

1. The pressure-treated wood boardwalk:

- Was carefully fit around existing large rocks keeping disturbance of the natural lakeshore to a minimum and giving the impression the boardwalk and rocks belong together.
- The pressure treatment in the wood created a strong odor. The manufacturer’s method of treatment directly affects this element. Future design specifications should be written to get the treatment method that will eliminate or significantly reduce this negative odor.

With the addition of the laminated wood beam arch bridge, a necessary functional intrusion in the landscape is transformed into a more appealing graceful form than the previous steel linear bridge. In addition, the change from approximately 30 feet in width to 8 feet in width puts the bridge in scale with the trail and the rest of the constructed features.

2. The connecting trail reconstruction:

- Obliteration and re-contouring of a portion of the old highway helped reduce the trail visibility when viewed from the other side of the lake.
- Some dry-site and wet-site plants were planted on the wrong site. As a result, some trees may not survive. We need to allow adequate time to coordinate unusual aspects of contracts when they are a new element for our project inspector and contracting officer representative.
- Adding a color to the concrete for the trail would have created a more natural appearance. However, the cost of color additive can present a significant cost increase.

These new, or reconstructed features are not readily apparent from Highway 244 (part of the Peter Norbeck National Scenic Byway), though past constructed features are more evident. Overall, the constructed features are visually subordinate to the overall landscape when viewed from this highway.

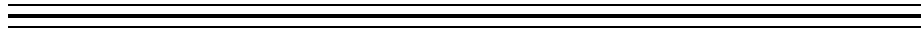
When viewed from various locations along the lakeshore, the new features (bridge and boardwalk) are evident but do not dominate the site. As the wood on these structures weathers, these features should become less dominant.

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This project was judged to meet the Scenic Integrity Objective of MODERATE.

	Scenic Integrity Objective	Scenic Integrity Achieved	Development Level
Horsethief Day Use – Accessible Trail and Bridge	Moderate	Moderate	3

Tradeoffs to reduce costs will continue to challenge the designer as they strive to meet the Land and Resource Management Plan standards and guidelines. Future projects will continue to require careful planning to meet the assigned Scenic Integrity Objective.



Monitoring Item 28: Heritage Resources

Objectives:

403. Improve the management of heritage resources and integrate them with recreation and education while providing for compliance with all applicable laws and regulations.
 - a. Increase numbers and types of heritage resource interpretive sites and opportunities. Provide five projects per year during the plan period.
 - b. Conduct six heritage resource stabilization and rehabilitation projects per year during the plan period.
 - c. Nominate eligible sites (approximately five per year in the plan period) to the National Register of Historic places.
 - d. Inventory 50,000 acres each year in the plan period for heritage resource sites.
404. Conduct three research projects each year to support heritage resource management.
405. Manage all heritage sites listed in the National Register of Historic Places in consultation with the State Historical Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation (ACHP).
406. Provide opportunities for the public to participate in heritage management activities, including the monitoring, excavation, and protection of archeological sites.

Monitoring:

Introduction.

Heritage monitoring efforts are used to measure the level of success in meeting management goals and

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objectives for heritage resources. The level of success can be measured each year.

Direction for management of heritage resources is provided in Goal 4 of the Forest Plan: “Heritage resources will be protected and interpreted so visitors can better understand their environment and how heritage resources fit into the context of multiple-use management” (Forest Plan, pp-I-23). Heritage objectives are listed above.

FY-2003 Monitoring Accomplishments

Monitoring items for the heritage resource program measure two areas of emphasis. Monitoring Items 1 through 4 reflect our responsibility to comply with federal law and regulation for the protection of heritage resources under Section 106 of the National Historic Preservation Act (NHPA) (See Table 1.) The relatively large numbers exhibited in Monitoring Items 1 through 4 are in themselves a reflection of the large number of undertakings conducted on the Black Hills National Forest each year and funded through the primary purpose philosophy by other resource programs. Completion of heritage compliance protocols is required before project implementation. This year less time was provided for project monitoring and is reflected in the reduced accomplishment for Monitoring Item 2 in Table 1.

Monitoring Items 5 through 7 reflect the agency’s responsibility to preserve and interpret heritage resources for public benefit under Section 110 of the NHPA. These program activities are funded directly by heritage program funds as the primary purpose function. The relatively low numbers exhibited in Monitoring Items 5 through 7 indicate a lack of adequate funding to meet proposed accomplishments in the Section 110 portion of the heritage resource program.

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Table 1. Heritage Monitoring Accomplishments

Monitoring Items	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003
1. Heritage resources compliance process completed prior to signing of environmental decision document (comply with NEPA, NHPA, and Chiefs Direction).	229 Projects	59 Projects	107 Projects	51 projects	124 projects	177 Projects
2. Avoidance or mitigation requirements effectively implemented prior to, during, and after project (comply with NHPA/NEPA).	32 mitigation or avoidance projects were monitored.	26 mitigation or avoidance projects were monitored.	41 mitigation or avoidance projects were monitored.	189 mitigation or avoidance projects were monitored.	51 mitigation or avoidance projects were monitored.	17 avoidance projects were monitored.
3. Inventories conducted to comply with the Archaeological Resource Protection Act, as amended 1988.	76 projects covering 93,873 acres were completed.	225 projects covering 78,938 acres were completed.	127 projects covering 28,686 acres were completed.	137 projects covering 41,713 acres were completed.	92 projects covering 78,891 acres were completed.	81 projects covering 61,375 acres were completed.
4. Protection of heritage resources listed in, or eligible for listing on the National Register of Historic Places. May or may not be associated with project specific activities (comply with NHPA).	106 sites were monitored.	97 sites were monitored.	143 sites were monitored.	248 sites were monitored.	36 sites were monitored.	29 sites were monitored.
5. Number of heritage resource interpretive sites provided (including sites, signs, roadside pullouts, brochures, public participation opportunities, sponsorship of heritage activities, etc.).	2 public outreach projects, and 1 interpretive program were provided.	25 interpretive programs were provided.	27 interpretive programs were provided.	34 interpretive programs were provided.	21 interpretive programs were provided.	29 interpretive programs were provided.
6. Number of heritage resource stabilization and rehabilitation projects conducted (comply with NHPA).	1 project was conducted.	2 projects were conducted.	5 projects were conducted.	2 projects were conducted	2 projects were conducted	2 projects were conducted.
7. Increase in heritage resources listed on the National Register of Historic Places (comply with NHPA).	0 sites were nominated to or listed on the NRHP.	0 sites were nominated to or listed on the NRHP.	0 sites were nominated to or listed on the NRHP.	0 sites were nominated to or listed on the NRHP.	0 sites were nominated to or listed on the NRHP.	1 site was nominated to or listed on the NRHP.

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Evaluation:

403. Improve the management of heritage resources and integrate them with recreation and education while providing for compliance with all applicable laws and regulations.

403.a. Two stabilization and rehabilitation projects were completed in FY2003 including the Gorman and Curran cabin restoration projects. These projects were initiated in 2002 and completed in June 2003. Both projects were implemented as Passport In Time (PIT) programs. Both projects were initiated and completed in consultation with the South Dakota State Historic Preservation Office (SHPO). An increase in heritage program funding will be needed to meet the Forest objective of six projects per year over the planning period.

403.b. In FY2003 the Forest completed and submitted the National Register Nomination for the historic Mt. Roosevelt Tower. The South Dakota State Historic Preservation Office has asked for revisions. These will be completed in FY2004. However, the nomination will be counted as part of FY2003 accomplishments.

404. Conduct three research projects each year to support heritage resource management.

In FY2003 the Forest completed a Management Plan for rock art properties on the Black Hills National Forest. The document was compiled under a contract with the National Park Service. The plan included a management overview for rock art properties in general and provided specific recommendations for 13 rock art sites in the southern Black Hills.

In order to meet the Forest objective of three research projects per year, an increase in heritage program funding is needed. The Forest is currently meeting this objective at a minimum level. Research opportunities can be increased if management of funding for cost-share partnerships can be administered at the Forest level.

405. Manage all heritage sites listed in the National Register of Historic Places in consultation with the State Historic Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation (ACHP).

The Forest maintains a strong relationship with the South Dakota and Wyoming SHPOs and the Advisory Council on Historic Preservation on listed and eligible properties. The heritage program is meeting this objective.

406. Provide opportunities for the public to participate in heritage management activities, including the monitoring, excavation, and protection of archaeological sites.

Through the PIT program the public has participated in excavation and restoration projects each year. In FY2003 a Passport In Time project utilizing public volunteers was successfully implemented at the Curran Cabin Project on the Northern Hills Ranger District.

Monitoring Item 30: Recreation Opportunities

Objectives:

407. Provide the following Recreation Opportunity Spectrum (ROS):

Recreation Opportunity Spectrum (ROS) (Thousands of Acres)	
Primitive	11
Semi-Primitive Non-Motorized	18
Semi-Primitive Motorized	12
Roaded Natural	1107
Roaded Natural Non-Motorized	95
Rural	1

408. Manage recreation use to stay within the capacity for the ROS class:

ROS Class	Capacity Range Recreation Visitor Days (RVDs/Acre)		
	Low	Moderate	High
Primitive	0.25	0.5	0.75
Semi-Primitive Non-Motorized	1.00	2.0	3.00
Semi-Primitive Motorized	1.50	3.0	4.50
Roaded Natural Non-Motorized	1.50	3.0	4.50
Roaded Natural	3.00	6.0	9.00
Rural	<<<< Design Capacity >>>>		

(See glossary for ROS capacity classes)

Monitoring:

Recreation Activity: Recreation Opportunities across the Forest

The 1997 Forest Plan identified objectives for capacities of the ROS classes expressed in recreation visitor days (RVDs). No monitoring data or techniques concerning this data are available to determine the degree to which the Forest is meeting this objective. Beginning in 2004, four selected semi-primitive motorized areas will be monitored for motorized encroachment to determine if this ROS objective is still being managed.

Evaluation:

Recreation opportunity spectrum capacity objectives by ROS class have not been monitored, and 2004 will mark an initial year of developing a monitoring effort on selected ROS areas. Semi-primitive non-motorized areas most susceptible to losing the character prescribed in the Forest Plan will be monitored.

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General anecdotal evidence of how well the Forest is meeting these objectives may be evident through monitoring of developed recreation use, dispersed recreation activities, and trail counter data from wilderness use.

Activity Outputs	Units	1999	2000	2001	2002	2003
Developed Recreation	Recreation Visitor Days	339,600	331,600	326,600	321,100	328,700
Downhill Skiing	Recreation Visitor Days	4,000	*	*	*	*
Dispersed Recreation	Recreation Visitor Days	2,886,800	2,820,200	2,789,200	2,908,100	3,102,840
Off-road Vehicle Use	Recreation Visitor Days	75,900	77,000	73,400	80,900	80,900
Wilderness Use	Recreation Visitor Days	36,500	32,200	30,900	35,994	32,360

* Terry Peak Ski area transferred from Forest to private land in an exchange.

Monitoring:

Developed Recreation Discussion

The backlog of deferred maintenance needs for our developed sites continues to be a major concern related to meeting Forest Plan standards for maintaining developed recreation sites. Operation and maintenance funding from appropriated dollars has been historically insufficient to meet the needs. The Forest makes use of service partners wherever possible, such as our campground concessionaire. Forestwide, our fee sites are paying for day-to-day operation through the concession permit. Special-use fees paid to the Forest from the concessionaire are re-invested into our developed sites through the Granger-Thye fee offset program. In 2003, this fee system enabled the Forest to re-invest approximately \$54,000 in permit fees back into our developed sites. The Black Hills National Forest Visitor Center overlooking scenic Pactola Lake and satellite visitor information stations at our district offices provided significant developed-and-dispersed-recreation starting points for the visiting public.

Evaluation:

The success of the Forest's developed recreation management program could be considered an indication the Forest is meeting Forest Plan objectives in providing urban and roaded natural recreation opportunities within the capacity objective.

Monitoring:

Dispersed Recreation Discussion

The Black Hills National Forest continues to be a leader in providing dispersed recreation as evidenced by the following opportunities: Mickelson and Centennial Trails, snowmobiling, cross-country skiing, ATV and ORV routes, an established network of Forest roads and hiking trails, the Peter Norbeck Scenic Byway, a multitude of fishing opportunities at National Forest lakes, and some of the best elk and deer hunting in South Dakota and Wyoming.

The Black Hills National Forest is well roaded with over 6,000 miles of federal, state, county and Forest Service roads serving 1.3 million acres of National Forest land. Because of this situation, limited opportunities exist for non-motorized or unroaded kinds of recreation experiences. Three official inventoried-roadless areas on the Forest as established in the 1997 Revision to the Black Hills National Forest Land and Resource Management Plan are as follows: Beaver Park roadless area on the Northern Hills Ranger District in South Dakota and the Sand Creek and Inyan Kara roadless areas on the Bearlodge Ranger District in Wyoming.

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Evaluation:

The dispersed recreation opportunities discussed here provide background information that the Forest is providing a wide range of ROS classes but with emphasis on roaded recreation opportunities, both roaded natural and/or semi-primitive motorized. How the Forest is doing in meeting the overall Forest Plan ROS objectives cannot be determined using the monitoring data currently gathered, but beginning in 2004 selected ROS areas of limited size, specifically semi-primitive non-motorized, will be field checked to determine if the ROS classification is being achieved.

Monitoring Item 31: Recreation Use, Trends, and Demographics

Objectives:

- 413. Provide interpretation, information and environmental education as an important part of outdoor recreation. Use "Tread Lightly", "Leave No Trace" and other techniques.
- 417. Coordinate trail development with the State Comprehensive Outdoor Recreation Plan (SCORP). Develop trail facilities in cooperation with other agencies and partners.
- 419. Provide for the annual designation and management of 350 miles of snowmobile trail by the States of Wyoming and South Dakota. Annual changes to the trail system should be limited.
- 422. Provide the following off-road travel opportunities:

Category	Percentage Of Forest
All Motorized Travel Allowed Yearlong	59.1%
Seasonal Restrictions Apply	22.8%
Seasonal Restrictions - No Off-road Travel	3.2%
Backcountry Motorized Recreation on Designated Trails	1.0%
Only OHV Travel Prohibited	11.4%
Motorized Travel Prohibited Except Snowmobiles	1.2%
All Motorized Travel Prohibited	1.3%

Monitoring:

Objective 413

The Forest's interpretation information and environmental education efforts are monitored through the number of products offered. Recreation funding (NFRW) provided a target of 23 interpretation and environmental education products to standard, which was met and reported in the Forest's annual Management Attainment Report (MAR). These products included an aggressive interpretive program at the Pactola Lake visitor center.

The Forest provided support to the Wyoming and South Dakota Project Learning Tree (PLT) programs through grants. The Moon Walk program, offered by the Mystic Ranger District, presented six programs

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during the spring, summer, and fall across the Forest with participation by all districts. The Pactola Visitor Center, located along Highway 385, was open seven days a week from the middle of May to the end of September. The Visitor Center provided information, education, and interpretation exhibits, including “Tread Lightly” messages and literature, on the Forest and its environment to over 67,000 visitors. The Mystic Ranger District manages the Center with funding for its operation provided entirely by recreation program funds.

On high-use weekends during the summer, the Hell Canyon Ranger District presented wilderness education programs at the Horsethief Lake Campground that incorporated “Leave No Trace” messages. In addition, each district presented several programs to area schools and interest groups.

Evaluation:

Through its visitor center, moon walks, wilderness education, and interpretive portal signs along with other information and education efforts, the Forest continues to fully meet and exceed this Forest Plan objective. The Forest’s partnership with the Black Hills Parks and Forest Association also provided staffing assistance at the visitor center, publications and interpretive products at Forest outlets, and supplemental funding for interpretive exhibits at the visitor center.

Monitoring:

Objective 417

The Forest continued its funding support for construction projects associated with the Mickelson Trail facilities. Total Forest funding for the South Dakota Department of Game, Fish, and Parks managed Mickelson Trail (old Burlington railroad route) over the past ten years has exceeded one million dollars. The Forest continued work on preparing plats for issuance of an easement for the route where it crosses National Forest System lands. The Forest continued its share of management of the Centennial Trail, a designated National Recreation Trail (NRT) jointly managed by Custer State Park, Black Hills National Forest, Bureau of Land Management, and the National Park Service. Trail work included annual trail maintenance and trail reconstruction efforts on the trail portions located on National Forest System lands.

Evaluation:

The Forest is meeting this Forest Plan objective through its cooperative management of the Mickelson Trail and the Centennial Trail, along with its input to the South Dakota State Comprehensive Outdoor Recreation Plan (SCORP).

Monitoring:

Objective 419

The Forest continued its participation in Memorandum of Understanding (MOU) with the Wyoming and South Dakota Snowmobile Trail programs with snowmobile trails located, signed, managed, and groomed on the Bearlodge Ranger District by the State of Wyoming and on the Northern Hills, Mystic, and Hell Canyon Ranger Districts in South Dakota. The Forest issued its annual winter travel management special order, which provides for snowmobile and cross-country ski trails on the Forest.

Evaluation:

This Forest Plan objective is being met through the Forest’s fulfillment of its responsibilities outlined in its MOUs with the Wyoming and South Dakota snowmobile programs.

Monitoring:

Objective 422

Monitoring and evaluation of this Forest Plan objective is provided for under Monitoring Item 33 Access – Off-Road Vehicle Access.

Monitoring Item 32: Access and Road Mileage

Objectives:

309. Provide the following changes to the National Forest System roads in support of long-term sustainable production of commodities.

Road Construction	280 miles/decade
Road Reconstruction	870 miles/decade
Road Obliteration	140 miles/decade
Two-track Obliteration	270 miles/decade

420. Manage travel corridors for federal, state and county roads.

- a. Meet a scenic integrity objective of high.
- b. Provide recreation facilities, trailheads, trail crossings and other road corridor components to meet demand.
- c. Include opportunities for pedestrians and bicycle ways.
- d. Use cooperative opportunities for development of outdoor facilities, such as provided for in the Intermodal Surface Transportation Efficiency Act (ISTEA) as an integral part of corridor planning.

421. Provide the following road system:

Roads (By End of the First Decade)		
Suitable for Public Use		4,700 miles
Passenger Car	1,200 miles	
High Clearance Vehicles	3,500 miles	
Roads Closed to Vehicles		500 miles
TOTAL		5,200 miles

Monitoring:

Objective 309 and 421:

The following is the status of the National Forest System (NFS) roads in FY2003:

	FY98 Miles	FY99 Miles	FY00 Miles	FY01 Miles	FY02 Miles	FY03 Miles
NFS Maintenance Levels 1,2,3,4,5	5,219	5,271.0	5,281.1	5,385.1	5,397.1	5449.0
NFS Miles Constructed	13.3	21.2	1.6	2.1	7.0	9.0
NFS Miles Reconstructed	102.0	178.1	53.6	21.3	75.7	87.0
NFS Miles Under Forest Service Jurisdiction	4,655.0	4,696.0	4,706.0	4,800.0	4,812.0	4839.0
NFS Miles Under Local Government Jurisdiction	564.0	575.0	575.1	585.1	585.1	610.0

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	FY98 Miles	FY99 Miles	FY00 Miles	FY01 Miles	FY02 Miles	FY03 Miles
NFS Miles Obliterated	0.0	27.3	18.3	19.9	0	3.7
NFS Miles Open Year Long, Seasonally For Low Clearance Vehicles	687.0	689.0	734.0	741.0	718.0	715.0
NFS Miles Open Year Long, Seasonally Which Are Accessible To High Clearance Vehicles Only	3,274.0	3,280.0	3,236.0	3261.0	3,258.0	3158.0

	1997 Revised Forest Plan (Miles/decade)	Accomplished FY1998 (Miles)	Accomplished FY1999 (Miles)	Accomplished FY2000 (Miles)	Accomplished FY2001 (Miles)	Accomplished FY2002 (Miles)	Accomplished FY2003 (Miles)	Accomplished FY1998-FY2003 (Miles)
Road Construction	280	13.3	21.2	1.6	2.1	7.0	9.0	54.2
Road Reconstruction	870	102.0	178.1	53.6	21.3	75.7	87.0	517.7
Road Obliteration	140	~	27.3	18.3	19.9	0	3.7	69.2
Two-track Obliteration	270	24.8	34.0	23.5	32.7	6.0	9.0	130.0

Evaluation:

Objectives 309 and 421

Forest Plan Activities (Miles)	Accomplished FY1998-FY2003	Percent of Annual Compliance FY1998 – FY2003	Current Level - Percent of Total Goal
Road Construction	8.4 miles/yr	30%	18%
Road Reconstruction	79.8 miles/yr	92%	55%
Road Obliteration	11.5 miles/yr	82%	49%
Two-track Obliteration	21.7 miles/yr	80%	48%
	Current Inventory		
Suitable for Public Use	3,873 miles		82%
Passenger Car	715 miles		60%
High Clearance Vehicles	3,158 miles		90%
Roads Closed To Vehicles	966 miles		193%

Monitoring:

Objective 420

The Forest objective of maintaining a high scenic integrity objective (SIO) along federal, state, and county roads was achieved through vegetation management in conjunction with the Healthy Forest Initiative and an active timber sale program. Cooperative programs have been accomplished with other agencies, especially South Dakota Department of Transportation (SDDOT) and local counties. The Forest also annually submits project proposals for funding through the Intermodal Surface Transportation Efficiency Act (ISTEA) program

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as well as the Forest Highway (FH) and Public Forest Service Road (PFSR) program.

The Forest objective of maintaining and repairing major culverts and bridges for Forest access resulted in the replacement of five bridges, repair of one bridge, and repair of one culvert. Two bridges were removed from the forest system and sites were reclaimed and landscaped.

Evaluation:

Objective 420

Through its active National Byway management efforts, participation in the ISTEAF funding programs, and scenic management specialist input on timber analysis project areas, the Forest continues to meet this Forest Plan Objective at a high level of compliance.

Monitoring Item 33: Access and Off-Road Vehicle Access

Objective 422. Provide the following off-road travel opportunities:

Category	Percentage of Forest
All Motorized Travel Allowed Yearlong	59.1%
Seasonal Restrictions Apply	22.8%
Seasonal Restrictions - No Off-road Travel	3.2%
Backcountry Motorized Recreation on Designated Trails	1.0%
Only OHV Travel Prohibited	11.4%
Motorized Travel Prohibited Except Snowmobiles	1.2%
All Motorized Travel Prohibited	1.3%

Monitoring:

The Forest is working towards updating the GIS database so accurate data runs can be conducted to determine the progress made on meeting the objectives for each of these travel management categories. A travel management mapping effort to determine and display accurate information for public use began in 2002 and is expected to be completed sometime in 2004. Accurate acreage reporting and determination of effective area closures, which have accompanying special orders available for enforcement, will result from this mapping effort.

Monitoring Item 34: Access and Trail Opportunities

Objectives.

416. Maintain and construct trails as displayed in the following table:

Non-motorized Trails (1996)	293 miles
Motorized Trails (1996)	14 miles
Non-motorized Trail Construction	204 miles
Motorized Trail Construction or Conversion from Road to Motorized Trail	15 miles
Total Forest Trail System	526 miles
Reconstruction	100 miles

417. Coordinate trail development with the State Comprehensive Outdoor Recreation Plan (SCORP).
Develop trail facilities in cooperation with other agencies and partners.

418. Enhance the trail system to disperse use away from the Black Elk Wilderness.

419. Provide for the annual designation and management of 350 miles of snowmobile trail by the States of Wyoming and South Dakota. Annual changes to the trail system should be limited.

Monitoring:

Objective 416

1997 Revised Forest Plan			FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	Total FY1998 – FY2003
Existing Trail Inventory:									
Non-motorized Trails (1996)	293 miles		411.1 ³	296.0 ³	307.9	318.6	318.6	332.8	332.8
Motorized Trails (1996)	14 miles		24.6	24.6 ³	14.2	14.2	14.2	13.7	13.7
New Trail Construction:	~		~	~	~	~	~	~	~
Non-motorized Trail Construction	204 miles ¹		0.00	0.00	0.00	0.00	0.0	0.0	0.0
Motorized Trail Construction or Conversion from Road to Motorized Trail	15 miles ¹		0.00 ³	0.00	0.00	0.00	0.0	0.0	0
Total Forest Trail System	526 miles ²		435.7	320.6 ³	322.1	332.8	332.8	346.5	346.5 ⁴
Reconstruction	100 miles ¹		70.1 ³	2.70	12.6	18.0	4.2	10.2	117.8

¹Per decade

²Total Miles at End of Decade

³Inventoried miles at end of FY1998 and FY1999. FY1999 reflects Mickelson Trail operation and maintenance being transferred to the State of South Dakota (115.1 miles).

⁴Inventoried miles at end of FY2003 have increased compared to FY1999 due to improved accuracy of the database.

Black Hills National Forest

Evaluation:

Objective 416

Forest Plan Objective	Percent Compliance FY1998 – FY2003
Non-motorized Trail Construction	¹ 0%
Motorized Trail Construction or Conversion from Road to Motorized Trail	² 0%
Reconstruction	³ 107.6%

Figures are based on the following goals by the end of the first decade:

¹ increase of 20.4 miles per year

² increase of 1.5 miles per year

³ increase of 10 miles per year

Monitoring:

Objective 418

Opportunities for pedestrians, equestrians, and bicyclists were provided through continued cooperation with the South Dakota Department of Game, Fish, and Parks in the management of the Mickelson Trail, which is non-motorized except for seasonal snowmobile use between Deadwood and the Dumont Trailhead. Additional trail improvement projects within the forest in and around recreation facilities and relocation of portions of the Centennial Trail provided significant upgrades for visitor recreation and to disperse recreation activities away from the Black Elk Wilderness.

Monitoring:

Objective 419

See Monitoring Item 31.

Monitoring Item 35: Access and Right-Of-Way Acquisition

Objective 503. Acquire approximately 25 rights-of-way each year to improve Forest access.

Monitoring:

		FY1998				FY1999		
Type	Cases	Miles	Acres		Cases	Miles	Acres	
Acquired	6	1.4	11.04		8	1.09	10.55	
FLPMA*	~	~	~		~	~	~	
Forest Road Easements Conveyed	2	1.48	11.87		3	.095	4.07	
Private Road Easements Conveyed	5	1.21	7.99		7	.8067	6.5	
FRTA** Easements ¹	2	13.45	244.8		0	0	0	

		FY2000				FY2001		
Type	Cases	Miles	Acres		Cases	Miles	Acres	
Acquired	8	1.73	13.15		12	6.2	24.6	
FLPMA*	~	~	~		~	~	~	
Forest Road Easements Conveyed	3	1.10	4.7		4	3.5	14.1	
Private Road Easements Conveyed	7	.95	4.9		3	6.7	26.7	
FRTA** Easements ¹	0	0	0		0	0	0	

		FY2002				FY2003		
Type	Cases	Miles	Acres		Cases	Miles	Acres	
Acquired	3	4.2	10.6		2	2.9	11.8	
FLPMA*	~	~	~		~	~	~	
Forest Road Easements Conveyed	1	.09	.69		6	2.5	20.08	
Private Road Easements Conveyed	17	6.06	25.8		14	1.9	15.37	
FRTA** Easements ¹	0	0	0		2	0.3	2.52	

*FLPMA - Forest Land Policy Management Act

**FRTA - Forest Road and Trail Act

¹Previously under special use permit that was converted to easements in 1998

Evaluation:

The Forest has acquired 20 percent of the Forest Plan right-of-way objective in the 6 years of the 1997 Forest Plan.

Monitoring Item 36: Land Adjustment

Objectives:

501. Conduct approximately 500 to 1000 acres of land exchange each year over the decade, such as through purchase, exchange or donation, whenever lands meet land-adjustment criteria in Guidelines 8101 through 8104.

502. Provide timely response to landowner requests for access across the National Forest.

504. Actively seek local government and tribal government input and support for those exchanges that substantially change the balance of federal and private lands.

505. Work with conservation groups, state agencies and others to develop and implement cost-effective land and resource protection measures such as conservation easements, etc.

Monitoring:

Land Acquired Through Acquisition

	FY1999	FY2000	FY2001	FY2002	FY2003
Land Adjustment Completed	Acres	Acres	Acres	Acres	Acres
Land Acquired through Purchase	~	~	~	259	966
Land Acquired through Exchange	479	526	170	330	433
Land Acquired through Donation	-0-	0	0	0	80
Total Acquired	479	526	170	589	1,479
LESS:	~	~	~	~	~
Land Conveyed Out	498	575	89	176	475
NET CHANGE	-19	-49	+81	+413	+1,004

Land Being Acquired Through Acquisition

~	FY1999	FY2000	FY2001	FY2002	FY2003
Land Adjustment Being Processed	Acres	Acres	Acres	Acres	Acres
Land Acquiring through Purchase				1,156	280
Land Acquiring through Exchange	894	683	617	473	1,020
Land Acquiring through Donation	-0-	80	80	80	0
Total Acquiring	894	763	697	1,709	1,300
LESS:	~	~	~	~	~
Land Conveying Out	723	606	641	504	1,070
NET CHANGE	+171	+157	+56	+1,205	+230

Black Hills National Forest

Evaluation:

The Forest has continued to foster communication with several conservation groups and state agencies with the objective of completing land adjustment exchanges and/or conservation easements for everyone's benefit. The Forest is a member of the Black Hills Conservation Initiative, which is a partnership of private landowners, communities, state and federal agencies, and other conservation groups, to protect wildlife habitat and open space. The Forest has stressed land exchanges over conservation easements as the means to benefit the public. These exchanges can be time consuming (sometimes as long as three to five years), but the outcome of a more efficient and manageable land pattern is worth the time and effort expended.

Landowner requests for access across the National Forest are acted on as quickly as possible. The Forest has also been given the authority to sign the permits authorizing this use. Previously, the permits needed to be signed by the Regional Office. This change will be a benefit to the public because requests can be acted on more quickly.

The Forest actively seeks input and support from local and tribal governments with respect to land exchanges. The local and tribal governments are notified early in the exchange process and asked if they have any concerns or recommendations regarding the exchange proposal. Any concerns or recommendations related are considered and evaluated throughout the exchange process. The governments are again notified during the NEPA phase of the project and again at the time of a decision being made.

Monitoring Item 37: Economic Efficiency

Objectives:

601. Strive to reduce net costs of both market and non-market programs.

602. Maintain the ability to respond to budget reductions by keeping overhead and fixed costs, including salaries, at less than 70 percent of the Forest budget.

Monitoring:

Objective 601

		FY98	FY99	FY00	FY2001	FY2002	FY2003
FUND CODE	FUND	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS
	RECREATION, WILDERNESS AND HERITAGE RESOURCES	~	~	~	~	~	~
	OPERATIONS	~	~	~	~	~	~
NFRW	Recreation/Heritage/Wilderness	989,000	679,000	698,000	908,600	894,800	900,300
	INVESTMENTS	~	~	~	~	~	~
CMTL	Trail Capital Improvements & Mtce.	222,000	170,000	277,800	308,100	251,700	344,500
	TOTAL RECREATION WILDERNESS AND HERITAGE	1,211,000	849,000	975,800	1,216,700	1,146,500	1,244,800
	WILDLIFE AND FISH	~	~	~	~	~	~
NFWF	Wildlife & Fisheries Habitat Mgmt.	287,000	236,000	176,000	304,800	237,000	330,900
	TOTAL WILDLIFE AND FISH	287,000	236,000	176,000	304,800	237,000	330,900
	RANGE	~	~	~	~	~	~
NFRG	Livestock Grazing Management	317,000	457,000	307,800	405,400	387,700	470,000
RBRB	Range Betterment	52,000	68,000	48,300	51,400	42,300	68,100
NFN3	Rehabilitation & Restoration	*	*	*	4,940,300	2,570,600	281,800
	TOTAL RANGE	369,000	525,000	356,100	5,397,000	3,000,600	819,900

Black Hills National Forest

		FY98	FY99	FY00	FY2001	FY2002	FY2003
FUND CODE	FUND	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS
	TIMBER	~	~	~	~	~	~
	OPERATIONS	~	~	~	~	~	~
NFTM	Timber Management – Forest Products	4,933,000	5,109,000	3,900,400	4,921,000	7,539,100	4,753,200
	SALVAGE	~	~	~	~	~	~
SSSS	Timber Salvage	349,000	950,000	597,400	801,100	1,368,000	1,885,900
	TOTAL TIMBER	5,282,000	6,059,000	4,497,800	5,722,100	8,907,100	6,639,100
	WATER, SOIL, AND AIR	~	~	~	~	~	~
NFVW	Vegetation & Watershed Mgmt.	922,000	638,000	630,900	1,361,000	835,100	881,200
TRTR	Ten Percent Road and Trail Fund	458,000	1,010,000	476,800	357,100	57,800	393,000
	TOTAL WATER, SOIL AND AIR OPERATIONS	1,380,000	1,648,000	1,107,700	1,718,100	892,900	1,274,200
	MINERALS	~	~	~	~	~	~
NFMG	Minerals	206,000	192,000	161,200	432,600	324,200	370,600
	Less Revenues:	7,294	6,304	6,800	12,500	16,000	17,200
	TOTAL MINERALS	198,706	185,696	154,400	420,100	308,200	353,400
	INFRASTRUCTURE	~	~	~	~	~	~
	OPERATIONS	~	~	~	~	~	~
QMQM	Quarters Maintenance	32,000	61,000	16,900	4,900	14,800	38,200
HTER	Flood Repair	66,000	1,000	-0-	-0-	-0-	-0-
HWHW	Hazardous Waste Management (Nemo)	380,000	-0-	20,000	58,600	16,400	22,600
CMII	Deferred Maintenance	*	*	*	349,900	685,000	109,000
	INVESTMENTS	~	~	~	~	~	~
CMFC	Facilities Capital Improvements & Mtce.	239,000	584,000	1,722,700	1,260,400	648,800	5,517,100
CMRD	Roads Capital Improvements & Mtce.	1,609,000	1,970,000	1,942,000	2,300,300	2,452,700	3,199,300

Black Hills National Forest

		FY98	FY99	FY00	FY2001	FY2002	FY2003
FUND CODE	FUND	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS
	TOTAL INFRASTRUCTURE	\$2,326,000	\$2,616,000	\$3,701,600	\$3,974,100	\$3,817,700	\$8,886,200
	REAL ESTATE, PLANNING, AND LAW ENFORCEMENT	~	~	~	~	~	~
NFPN	Land Management Planning	240,000	115,000	289,200	987,200	1,488,700	1,516,000
NFIM	Inventory and Monitoring	70,000	254,000	1,436,500	1,481,600	996,900	345,100
NFMP	Inventory & Monitoring (Title VIII)	*	*	*	66,600	*	*
NFLE	Law Enforcement	95,000	71,000	52,700	91,000	86,100	-0-
NFLM	Landownership Mgmt.	524,000	486,000	668,400	724,900	617,600	672,400
LALW	Land Acquisition, Land and Water	32,000	16,000	36,500	15,200	52,400	99,400
LAAQ	Land Acquisition	*	*	*	5,200	42,200	*
SPEA	Economic Action Program (Community Assistance)	34,000	30,000	30,000	45,000	10,000	45,400
SPS4	Forest Health Management	*	*	*	*	*	152,100
SPS6	Economic Action, Tribal YCC, Rural Community Assist.	*	*	*	20,100	40,000	120,000
SPS7	Economic Action, Fire Protection & Pilot	*	*	*	166,000	-0-	-0-
	TOTAL REAL ESTATE, PLANNING, AND LAW ENFORCEMENT	\$995,000	\$972,000	\$2,513,300	\$3,602,800	\$3,333,900	\$2,950,400
NFGA	GENERAL ADMINISTRATION	1,287,000	1,498,000	981,600	*	*	*
	TRUST FUNDS	~	~	~	~	~	~
CWKV	Knutson-Vandenberg	3,320,000	2,591,000	2,678,400	1,837,400	1,509,500	2,236,100
RTRT	Reforestation	164,000	109,000	-0-	9,600	37,000	200,000
CWFS	Other Coop Work	603,000	432,000	298,300	131,100	130,900	625,973
NFNF	NFS-Protection and Management Reimbursements	211,000	408,000	461,800	249,500	359,200	126,900
HTAE	Federal Highway Administration Expense	7,000	13,000	12,000	10,400	7,000	10,000
NWBM 1	Water System Improvements	*	82,000	*	*	*	*
PEPE	Timber Roads Purchaser Elective	*	371,000	37,100	55,700	273,300	197,600

Black Hills National Forest

		FY98	FY99	FY00	FY2001	FY2002	FY2003
FUND CODE	FUND	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS
SPFH	Forest Health Management, Federal Land	26,000	133,000	7,200	240,200	291,600	210,900
NFSD NFSA	Senior Community Service Employment Program	41,000	136,000	131,800	143,600	131,400	95,900
	TOTAL TRUST FUNDS	4,372,000	4,275,000	3,626,600	2,677,500	2,739,900	3,703,373
	FIRE MANAGEMENT	~	~	~	~	~	~
BDBD	Brush Disposal	170,000	228,000	227,200	216,100	203,700	286,900
NFCC	Vegetation Treatment	*	~	~	~	~	352,700
WFPR	Fire Pre-suppression	1,676,000	2,174,000	2,738,500	3,769,500	3,478,200	3,026,700
WFHF	Hazardous Fuel Reduction (Title II)	362,000	451,000	810,300	952,800	2,536,900	2,371,300
WFW2	Hazardous Fuels Reduction (Title IV)	*	*	*	2,398,900	*	*
WFSU	Emergency Suppression and Rehabilitation	812,000	941,000	6,639,600	6,663,800	10,042,400	6,405,400
	TOTAL FIRE MANAGEMENT	3,020,000	3,794,000	10,415,600	14,001,100	16,261,200	12,443,000
	TOTAL ALL	\$20,735,000	\$22,664,000	\$28,513,300	\$39,046,900	\$40,661,000	\$38,662,473

Black Hills National Forest

Receipts:

Gross receipts before payments to counties:

	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003
DESCRIPTION	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS	DOLLARS
Timber	16,680,806	15,064,311	13,893,300	6,516,500	8,966,500	6,924,200
Grazing	117,983	117,186	118,300	106,300	116,300	107,500
Recreation - Special Uses (recreation residences)	74,499	80,198	133,900	108,200	118,200	142,100
Recreation - User Fees (admissions, outfitter guide permits)	31,213	15,546	21,500	20,400	21,400	26,000
Utility Special Use Permits	73,400	39,493	38,800	39,600	39,900	37,900
Minerals	7,294	6,304	6,800	12,500	16,000	17,200
Special Uses other than Recreation, Utilities, and Minerals	40,587	55,581	44,700	42,800	40,900	51,700
TOTAL	\$17,025,782	\$15,378,619	\$14,257,300	\$6,846,300	\$9,319,200	\$7,306,600

Black Hills National Forest

Evaluation:

Objective 601.

Program	Net Operating Costs					
	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003
	Dollars	Dollars	Dollars	Dollars	Dollars	Dollars
Recreation, Wilderness & Heritage Resources	-\$991,301	-\$658,181	-\$736,900	-\$1,005,700	-\$926,100	-\$987,100
Wildlife & Fish Operations	-\$287,000	-\$236,000	-\$176,000	-\$304,800	-\$237,000	-\$330,900
Range Operations	-\$251,017	-\$407,814	-\$237,800	-\$5,290,800	-\$2,884,300	-\$712,400
Timber Operations	\$11,398,806	\$9,005,311	\$9,395,500	\$794,400	\$59,400	\$285,100
Water, Soil, & Air Operations	-\$1,380,000	-\$1,648,000	-\$1,107,700	-\$1,718,100	-\$892,900	-\$1,274,200
Minerals	-\$198,706	-\$185,696	-\$154,400	-\$420,100	-\$308,200	-\$353,400
Infrastructure	-\$2,326,000	-\$2,616,000	-\$3,701,600	-\$3,974,100	-\$3,817,700	-\$8,886,200
Planning	-\$240,000	-\$115,000	-\$289,200	-\$987,200	-\$1,488,700	-\$1,516,000
Inventory & Monitoring	-\$70,000	-\$254,000	-\$1,436,500	-\$1,548,200	-\$996,900	-\$345,100
Law Enforcement	-\$95,000	-\$71,000	-\$52,700	-\$91,000	-\$86,100	(Regional)
Real Estate	-\$556,000	-\$502,000	-\$704,900	-\$745,300	-\$712,200	-\$771,800
Economic Action Programs	-\$34,000	-\$30,000	-\$30,000	-\$231,100	-\$50,000	-\$317,500
General Administration	-\$1,287,000	-\$1,498,000	-\$981,600	\$0	\$0	\$0
Trust Funds	-\$4,372,000	-\$4,275,000	-\$3,626,600	-\$2,677,500	-\$2,739,900	-\$3,703,373
Fire Management	-\$2,208,000	-\$2,853,000	-\$3,776,000	-\$7,337,300	-\$10,042,400	-\$6,405,400
TOTAL PLANNED	-\$2,897,218	-\$6,344,381	-\$7,616,400	-\$25,536,800	-\$25,123,000	-\$25,318,273
Emergency Fire Suppression and Rehabilitation	-\$812,000	-\$941,000	-\$6,639,600	-\$6,663,800	-\$6,218,800	-\$6,037,600
TOTAL EXPENDED	-\$3,709,218	-\$7,285,381	-\$14,256,000	-\$32,200,600	-\$31,341,800	-\$31,355,873

Black Hills National Forest

Program costs totaled \$38.7 million in FY2003 of which \$6.4 million was fire suppression, \$2.4 was hazardous fuel reduction, and another \$2.5 million was for restoration and rehabilitation resulting from previous years' fires. Revenues totaled \$7.3 million in FY2003. Timber revenues dropped from \$16.7 million in FY1998 to \$7 million in FY2003 because of a decline in national timber market prices over the past few years.

Net operating costs for FY2003 were \$31.4 million.

Both fire suppression and fire restoration and rehabilitation are unplanned expenses and are not annual budget items. Between 1998 and 2003, increases were seen in fire management, hazardous fuel reduction, timber management, environmental analysis, and forest planning. Fluctuation in programs such as fire management (\$12.4 million in costs), changing market price for timber (a decline from \$16.7 million in timber receipts in 1998 to \$285,000 in 2003), and the increased costs of environmental analysis and mitigation in project planning are a few of the factors causing increased net operating costs.

Update of Research Needs

The following research needs were identified in FY2003.

1. Northern Goshawk
 - population dynamics
 - seasonal movements
 - habitat use
 - home range size
2. Distribution and abundance of sensitive snail species
3. Evaluation of mountain pine beetle epidemics as habitat for cavity nesting birds
4. Wildlife use of snags on managed ponderosa pine forests
5. Expand geographic scope of ongoing marten study in the North Zone
6. Efficient multi-species monitoring protocols

List of Preparers

Item Number	Monitoring Item	Preparers
Introduction	What This Document Is	Jeffrey Ulrich
	Forest Plan Amendments	Edward Fischer
1	Air Quality	Dean Berger
9	Vegetative Diversity - Snag Retention	Cara Staab
13	Regeneration	Blaine Cook
14	Timber Production	Blaine Cook
17	Forage Utilization	Craig Beckner
18a	Sensitive Species: Plants	Deanna Reyher and Reed Crook
18b-j	Sensitive Species: Animals	Cara Staab
20a	Pine Beetle Susceptibility	Blaine Cook and Kurt Allen
20b	Pine Beetle Levels and Trends	Blaine Cook and Kurt Allen
20c	Insect and Disease Evaluations	Blaine Cook and Kurt Allen
21	Exotics	Blaine Cook and Kurt Allen
22	Fuel Loading Hazard	Dean Berger
23	Fuel Treatment	Dean Berger
24a	Fire Suppression	Dean Berger
24b	Fire Prevention	Dean Berger
25	Wildlife – Threatened and Endangered	Cara Staab
27	Scenic Integrity	Steve Keegan
28	Heritage Resources	Dave McKee
30	Recreation Opportunities	Rick Hudson
31	Recreation Use, Trends and Demographics	Rick Hudson
32	Access: Road Mileage	Craig Kjar
33	Access: Off Road Vehicle Access	Rick Hudson
34	Access: Trail Opportunities	Craig Kjar
35	Access: Right-of-Way Acquisition	Glenn Kostelecky
36	Real Estate: Land Adjustment	Glenn Kostelecky
37	Economic Efficiency - Cost	Tammy Cordell and Jeffrey Ulrich
	Compiling and Editing	Peggy Woodward and Gwen Ernst-Ulrich

Literature Cited

- Anderson, T. 2002. Conservation assessment of woodpeckers in the Black Hills National Forest. USDA Forest Service, Black Hills National Forest. Custer, SD. 51pp.
- Bailey, R.M. and M.O. Allum. 1962. Fishes of South Dakota. Miscellaneous publications, Museum of Zoology, University of Michigan, Ann Arbor, No. 119.
- Black Hills National Forest. 2000. Expert interview summary for the Black Hills National Forest Land and Resource Management Plan Amendment. Custer, SD. 151pp.
- Black Hills National Forest. 2004. 2002 Monitoring and five year evaluation report. Custer, SD. 123pp.
- Black Hills National Forest. 2004. Accelerated Watershed/Vegetation Restoration Plan 10 Year Strategy. Custer, SD. 16pp + maps.
- Buskirk, S. 2002. Conservation assessment for the American marten in the Black Hills National Forest, South Dakota and Wyoming. USDA Forest Service, Black Hills National Forest. Custer, SD. 51pp.
- Carlsen, R.E. 1977. A trophic state index for lakes. *Limnology and Oceanography* 22(2): 361-369.
- Evermann, B.W. and U.O. Cox. 1896. A report upon the fishes of the Missouri River basin. Report to the U.S. Commission on Fish and Fisheries 20(1894):325-429.
- Fecske, D.M., J.A. Jenks, C. Kopplin, and T.L. Serfass. 2003. A landscape analysis for American martens (*Martes americana*) in the Black Hills, South Dakota. Draft publication dated October 10, 2003. 34pp.
- Fecske, D.M., J.A. Jenks, and V.J. Smith. 2002. Field evaluation of a habitat-relation model for the American marten. *Wildlife Society Bulletin* 30(3):775-782.
- Frest, T. 1991. Survey of Spearfish Canyon and vicinity, Black Hills, South Dakota and Wyoming, for Oreohelix strigosa cooperi (Binney, 1858) and associated land snails. Final report prepared for USDA Forest Service Black Hills National Forest and USDI Fish and Wildlife Service South Dakota Field Office. Deixis Consultants, Seattle, WA. 59pp.
- Frest, T. 1993. Land snail survey of the Black Hills National Forest, South Dakota and Wyoming. Final report prepared for USDA Forest Service Black Hills National Forest and USDI Fish and Wildlife Service South Dakota Field Office. Deixis Consultants, Seattle, WA. 156pp + appendices.
- Frest, T. and E. Johannes. 2002. Land snail survey of the Black Hills National Forest, South Dakota and Wyoming summary report, 1991-2001. Final Report submitted to Black Hills National Forest. 127pp + appendices.
- Isaak, D.J., W.A. Hubert and C.R. Berry, Jr. 2003. Conservation Assessment for Lake Chub, Mountain Sucker, and Finescale Dace in the Black Hills National Forest, South Dakota and Wyoming.
- McDowell, B. 2004. E-mail message dated April 1, 2004 from Bob McDowell, Wyoming Game and Fish Department, Sheridan, WY to Steve Hirtzel, Black Hills National Forest, Custer, SD regarding the historic distribution of finescale dace in the Bear Lodge Mountains, WY.
- Najacht, C. 2004. Study show 130-150 cougars in the Hills. *Custer County Chronicle* Vol. 124 Issue 17 (April 28, 2004). Custer, SD.
- Olson, R.D. 1998. Finescale dace and lake chub survey. South Dakota Wildlife Diversity Small Grants Results and Reports. Report Number 99-12, South Dakota Department of Game, Fish and Parks, Pierre.
- Panjabi, A. 2001. Monitoring the birds of the Black Hills: Year 1. Final report submitted to Black Hills National Forest. Rocky Mountain Bird Observatory, Fort Collins, CO. 96pp.

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- Panjabi, A. 2003. Monitoring the birds of the Black Hills: Year 2. Final report submitted to Black Hills National Forest. Rocky Mountain Bird Observatory, Fort Collins, CO. 125pp.
- Panjabi, A. 2004. Monitoring the birds of the Black Hills: Year 3. Annual report submitted to Black Hills National Forest. Rocky Mountain Bird Observatory, Fort Collins, CO. 58pp.
- Pettingill, O.S. and N.R. Whitney. 1965. Birds of the Black Hills. Cornell Laboratory of Ornithology Special Publication No. 1. Cornell University, Ithaca, NY. 139pp.
- Piroutek, R. 1991. Water quality and eutrophication status of Deerfield Lake, Western South Dakota. Masters Thesis. South Dakota School of Mines and Technology, Rapid City, SD. 247 p.
- Royer, R.A. and G.M. Marrone. 1992. Conservation status of the regal fritillary (*Speyeria idalia*) in North and South Dakota. Denver, CO: USDI Fish and Wildlife Service.
- Rumble, M.A. 2002. Evaluation of mountain pine beetle epidemics as habitat for cavity nesting birds. Preliminary findings for ISA 203-02-020 to Black Hills National Forest. Rocky Mountain Research Station, Rapid City, SD. 16pp.
- Sabtan, A.A. 1988. Determination of longitudinal and lateral sediment distribution in Reservoirs; Ph.D. Thesis, South Dakota School of Mines and Technology, Rapid City, SD. 306 p.
- Sandrini, J. 2004. Personal communication between Joe Sandrini, Wyoming Game and Fish Department, and Cara Staab, Black Hills National Forest on May 4, 2004.
- Schmidt, C.A. 2002a. Conservation assessment for the Townsend's big-eared bat (*Corynorhinus townsendii*) in the Black Hills National Forest of South Dakota and Wyoming. USDA Forest Service, Black Hills National Forest. Custer, SD. 32pp.
- Schmidt, C.A. 2002b. Conservation assessment for the fringed bat (*Myotis thysanoides*) in the Black Hills National Forest of South Dakota and Wyoming. USDA Forest Service, Black Hills National Forest. Custer, SD. 29pp.
- SDGFP (South Dakota Department of Game, Fish and Parks). 1993. Statewide fisheries surveys, 1992. Survey of public waters. Part 2; Streams. Annual Report No. 93-9.
- SDGFP. 1994. Statewide fisheries surveys, 1993. Survey of public waters. Part 2; Streams. Annual Report No. 94-11.
- SDGFP. 1995. Statewide fisheries surveys, 1994. Survey of public waters. Part 2; Streams. Annual Report No. 95-4.
- SDGFP. 1996. Statewide fisheries surveys, 1995. Survey of public waters. Part 2; Streams. Annual Report No. 96-13.
- SDGFP. 1997. Statewide fisheries surveys, 1996. Survey of public waters. Part 2; Streams. Annual Report No. 97-13.
- SDGFP. 1998. Statewide fisheries surveys, 1997. Survey of public waters. Part 2; Streams. Annual Report No. 98-15.
- SDGFP. 1999. Statewide fisheries surveys, 1998. Survey of public waters. Part 2; Streams. Annual Report No. 99-20.
- SDGFP. 2000. Black Hills of South Dakota Fishing Guide. 19pp.
- SDGFP. 2001. Statewide fisheries surveys, 2000. Survey of public waters. Part 1; Lakes – Region 1. Annual Report No. 02-11.

Black Hills National Forest

- South Dakota Dept. Game, Fish and Parks. 2003. Second Working Draft, South Dakota mountain lion management plan: 2003-2012. Wildlife Diversity Program and Game Program, Division of Wildlife. Pierre, SD. 35pp.
- South Dakota Dept. Game, Fish and Parks. 2004. Bald eagle home page.
<http://www.sdgame.ino/Wildlife/WildlifePlans/BEIndex.htm>
- Steenhoff, K., L. Bond, K.K. Bates, and L.L. Leppert. 2002. Trends in midwinter counts of bald eagles in the contiguous United States, 1986-2000. *Bird Populations* 6:21-32.
http://srfs.wr.usgs.gov/pdf/Trends_midwinter.pdf
- Stewart, R.K. and C.A. Thilenius. 1964. Stream and lake inventory and classification in the Black Hills of South Dakota. Dingell-Johnson Project F-1-R-13, Job Numbers 14 and 15. South Dakota Department of Game, Fish and Parks, Pierre.
- Tallman, D., D. Swanson, and J. Palmer. 2002. The birds of South Dakota. South Dakota Ornithologist's Union, Aberdeen. 441pp.
- Thompson, W.L., G.C. White, and C. Gowan. 1998. Monitoring vertebrate populations. Academic Press, Inc. San Diego, CA. 365pp.
- Tigner, J. 2003. E-message dated 01/09/2003 from Joel Tigner (Batworks) to Beth Krueger et al., subject line: A mine is a terrible thing to waste....
- Tigner, J. and E.D. Stukel. 2003. Bats of the Black Hills: a description of status and conservation needs. South Dakota Dept. Game, Fish and Parks, Wildlife Division Report 2003-05.
- Tigner, J. and W.C. Aney. 1994. Report of Black Hills bat survey: October 1993 – October 1994. Black Hills National Forest. 19pp.
- US Geological Survey. 2003. U.S. bald eagle counts continue to climb slowly. Press Release dated July 21, 2003. Reston, VA. http://www.usgs.gov/public/press/public_affairs/press_releases/pr1771m.html.
- USDA Forest Service, Agricultural Handbook 666. (1987) *National Forest Landscape Management, Volume 2 - Chapter 8, Recreation*. Washington, DC: U.S. Government Printing Office.
- USDA Forest Service, Agricultural Handbook 701. (1995) *Landscape Aesthetics; A Handbook for Scenery Management*, and (2000) *Landscape Aesthetics Handbook Revision*. Washington, DC: U.S. Government Printing Office.
- USDA Forest Service. 1996. Black Hills National Forest 1996 Land and Resource Management Plan; Final Environmental Impact Statement. Custer, South Dakota.
- USDA Forest Service. 2003. Monitoring Implementation Guide. Black Hills National Forest. June 2003. pp 71. <http://www.fs.fed.us/r2/blackhills/projects/planning/2002Monitor/MonGuide.pdf>
- USDA Forest Service. (1997) *Land And Resource Management Plan*. Custer, SD: Black Hills National Forest, United States Department of Agriculture - Forest Service.
- Vierling, K. 2004. Report on woodpecker breeding in the Jasper Fire. Submitted to the US Forest Service, February 19, 2004. South Dakota School of Mines and Technology, Rapid City. 11pp.
- WYGF (Wyoming Game and Fish Department). 1996. Belle Fourche River Basin Plan. Plan Number FXSN8BF. Sheridan Region Fisheries Management Crew. pp 27.
- WYNDD (Wyoming Natural Diversity Database). 2002. Black Hills National Forest Element Occurrence Records. June 2002.